FACTORY

MANAGEMENT AND MAINTENANCE

APRIL 1945

B 29'S—DESTINATION TOKYO—ROLL OFF THE ASSEMBLY LINE NIGHT AND DAY

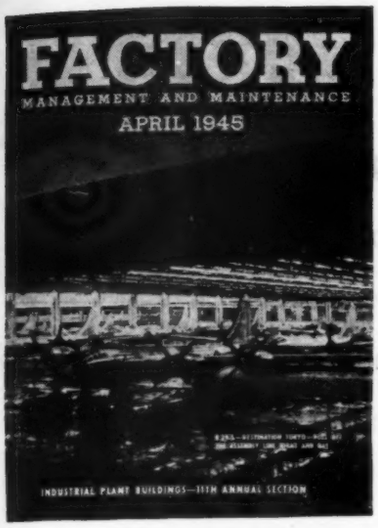
INDUSTRIAL PLANT BUILDINGS—11TH ANNUAL SECTION

NATIONAL ELECTRIC PRODUCTS
WIRING SYSTEMS
WIRES AND CABLES

In post-war building and remodeling, critical customers will look for electrical products of the highest quality and best performance. They will expect the promises of a great, new electrical age to be fulfilled. Contractors, their licensed craftsmen and electrical engineers who rely on the National Electric System of raceways, wires and cables will more than fulfill these expectations. And the user will find in National Electric products greater serviceability, longer life, and precise adaptability to specific requirements.

Conduits
Surface Raceways
Wires and Cables
for every purpose

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.



Dusk on the apron at Boeing Airplane Company, Wichita, Kan. Plant was first to get into Superfortress production—and has long been meeting WPB's stepped-up schedules. A Boeing kodachrome.

ALFRED M. STAEHLE, Publisher
L. C. MORROW, Editor
LEWIS K. URQUHART, Managing Editor
G. A. VAN BRUNT, C. B. COATES, Associate Editors • KATHLEEN NORTH, CARL G. WYDER, Assistant Editors • A. H. MOGENSEN, WHITING WILLIAMS, Consulting Editors • H. P. DUTTON, Chicago • C. B. GORDY, Detroit • E. J. STRICKLAND, Los Angeles • PAUL WOOTON, Washington • H. E. HILTY, Sales Manager.

Factory Management and Maintenance is a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering. Price 35c a copy. Publication office, 99-129 N. Broadway, Albany, N. Y. Address communications about subscriptions to Director of Circulation, 330 W. 42nd St., New York 18, N. Y. Subscription rates — United States, U. S. Possessions and Latin American Republics: $3, 1 year; $4, 2 years; $5, 3 years. Canada: $3.50, 1 year; $5, 2 years; $6, 3 years. Other countries: $5 or 30 shillings, 1 year; $8 or 48s, 2 years; $10 or 60s, 3 years. Please indicate position and company connection on all subscription orders. Cable Address, "McGrawhill, New York." Member, A.B.P. Member, A.B.C. Copyright 1945 by McGraw-Hill Publishing Co., Inc.

Factory Management and Maintenance, April, 1945. Vol. 103. No. 4. Published monthly, McGraw-Hill Publishing Co., Inc. Editorial, executive and circulation offices, 330 West 42nd Street, New York 18, N. Y. Entered as second class matter, November 13, 1936, at Post Office, Albany, N. Y., under Act of March 3, 1879.

District Managers: G. E. Pomeroy, Boston; L. E. Crist, Chicago; R. C. Greiner, Cleveland; T. W. Van Winkle, Detroit; J. S. Cawley, Joseph Gilbert, New York; E. Macaulay, Philadelphia; R. W. Garrison, Pittsburgh; C. J. Coash, St. Louis. Other offices at Atlanta, Los Angeles, San Francisco, Washington and London.

McGRAW-HILL PUBLISHING CO., INC.
JAMES H. McGRAW
Founder and Honorary Chairman

JAMES H. McGRAW, Jr. President
HOWARD EHRLICH Executive Vice-President for Business Operations
JOHN ABBINK Executive Vice-President for Editorial Operations
C. W. McGRAW Vice-President and Treasurer
J. E. BLACKBURN Director of Circulation
J. A. GERARDI Secretary

A McGRAW-HILL PUBLICATION

FACTORY
MANAGEMENT AND MAINTENANCE

APRIL · 1945

America Wants Prosperity...*James H. McGraw, Jr.* *preceding page* 81
Stop Private Taxation.....*L. C. Morrow* 81
Labor Skates or Labor Statesmen?.*Charles B. Coates* 82
How Traveling Stockrooms Solved a Layout Problem *Lewis K. Urquhart* 89
Providing Services to Keep People on the Job *Dan S. Mortensen* 94
Better Methods That Add Up to High Production.. 97
What Management Should Know About Teamwork *Stuart Chase* 101
Supervisory Incentives Make Foremen Managers *J. M. Druliner* 104
Materials Control Without Unnecessary Paperwork *A. Hoffman* 109
Management Shorts 113
Maintenance as the Editors See It.....*editorials* 116
Preventive Maintenance With Two Forms *H. H. Wermine and William Ratzer* 117
Control Heat, Save Fuel.....*Ames Penfield* 121
Overhead Platform Gives Low-Cost Work Space *Philip G. Swanson* 124
What to Do Before Reapplying Motors..*W. T. Brooks* 126
Conditions Inventory of Plant Service Equipment—7. Materials Handling Equipment, Part III..... 130
Maintenance Shorts 136
What's New in Equipment..... 140
You Want to Know....186 Labor Developments.. 194
They Say and Do.... 220 Books 234
Calendar ..... 236 Catalog Service B-96

and

Factory's Eleventh Annual Special Section

INDUSTRIAL PLANT BUILDINGS

Following page 340 (see special index, page B-3)

Behind the Scenes

See how the H & D package laboratory operates "behind the scenes." A typical product, never before packaged in corrugated, enters the laboratory. How H & D Package Engineers proceed with the design, development and testing of an engineered corrugated shipping box is photographically recorded, scene by scene. If you're interested in packaging, you'll want to see this detailed backstage presentation of the H & D package laboratory at work.

TAKE A LOOK AT PACKAGING IN ACTION

• Look at packaging from "behind the scenes." Go along with a Package Engineer while he designs an engineered shipping box. To get a better understanding of the science of package engineering, send for your copy of H & D's book, "Behind the Scenes at the H & D Package Laboratory." Write today.

Hinde & Dauch

AUTHORITY ON PACKAGING

THE HINDE & DAUCH PAPER COMPANY, 4547 DECATUR STREET, SANDUSKY, OHIO

Factories in BALTIMORE • BOSTON • BUFFALO • CHICAGO • CLEVELAND • DETROIT • GLOUCESTER, N. J. • HOBOKEN • KANSAS CITY • LENOIR, N. C. • MONTREAL • RICHMOND • ST. LOUIS • SANDUSKY, OHIO • TORONTO

AMERICA WANTS PROSPERITY

A BOOK to be published early in April by the McGraw-Hill Book Company carries the provocative title "Prosperity: We Can Have It If We Want It." Its authors, Messrs. Shields and Woodward, state in vigorously challenging terms their conviction that the United States will emerge from war with human, material and technological resources adequate to provide a nation-wide standard of living unprecedented in world history. They present, too, their formulation of the several policies and procedures which must be followed by government, business, and labor if we are to realize our potential for a high and sustained prosperity unmarred by prolonged periods of severe unemployment and business stagnation such as have haunted our economic past.

The specific proposals set forth will elicit both enthusiastic acclaim and acrid dissent, for the book deals in far from gentle fashion with many of the currently fashionable panaceas for assuring prosperity by magic formula. It examines, and discards as effective guarantors of prosperity, whatever their individual merits upon other grounds, programs for public works, slum clearance, subsidizing of small business, foreign loans, social insurance, deficit government spending, redistribution of income, the numerous formulae for monetary management, repeal of the anti-trust laws, or any of the loosely-phrased admonitions that government should do nothing and allow everything to take its course untrammeled by controls of any kind.

On the positive side, the book urges clear recognition of the fact that prosperity, under a system of business enterprise, depends primarily upon the existence of competitive incentives that spur capital investment to provide better tools and equipment, that improve organization and technology to insure continuously increasing productivity per man-hour of work, and that enlarge markets by producing what the consumer wants at lower prices to the end that real incomes may be increased.

In short, prosperity depends upon profitable and expanding business and employment opportunity, so it becomes the part of enlightened government, business, agriculture and labor policy to promote those measures which will forward rather than retard the major aim of expanding production.

However great the room for dissent upon the adequacy, or the phrasing, of the specific recommendations it makes, the approach of this book has one virtue of solid merit. It attacks positively the problem of what steps should be taken to achieve and hold prosperity rather than merely devising a poultice to be applied when and if we run into a decline.

Virtually all responsible spokesmen for government, and for business, labor, and agricultural groups, are agreed upon the goal of prosperity. Moreover, they agree that, insofar as possible, it should be achieved through the effort of private enterprise, with government intervention utilized only as a last resort. But despite this unanimity, almost all public discussion of the problem has concentrated upon the nature, the extent, and the timing of such government expenditures as may be found necessary to combat deflation. Since upon this question there is far from general agreement, our procedure has created an exaggerated sense of divergence in a field in which, so far as fundamentals go, we all are in accord to quite an unusual degree.

☆ ☆ ☆

No confusion should be caused by the fact that the generally current phrase for prosperity is "full employment." The latter phrase merely states the goal in terms of human values, which are good terms in which to state any goal. What matters is that we generally are agreed as to what we mean when we say that we want prosperity or full employment. Not only do we know what we mean, but within very rough limits we can give dimension to our concepts. There are a few whose appraisals are somewhat lower, but most competent estimators set the goals for about 1950 at an average annual employment in civilian jobs of between 55 and 57 million persons, with a gross national product of between $185 and $200 billion measured at 1943 price levels. This contrasts with the 1944 level of non-military employed of 51½ million, and a gross output for the end of 1944 of over $200 billion. It assumes a reduction of the average workweek to 40 hours.

It will take some such levels as these to provide employment for those who seek work, with only sufficient "frictional" unemployment (those temporarily listed as unemployed because of the normal turnover between jobs) to afford reasonable labor-market flexibility to both workers and employers. The non-military employment figures are generally consistent with the officially stated postwar goal of jobs for 60 million workers, since the latter figure is generally understood to be an estimate of the *labor force,* which includes members of the armed services and an allowance for frictional unemployment.

There are a number of reasons why the estimates cannot be figured more closely, and why no one can be very confident even of the validity of the stated limits. The chief points of doubt in the employment estimates relate to how many withdrawals there are likely to be on the part of women, oldsters, and youngsters, who now are in the labor force to a number more than 6 millions beyond normal expectancy; how many men will be retained in the armed forces; and whether the

postwar frictional unemployment should be calculated as approximating the current 1 million or the 3 million so-listed in the prosperous year of 1929. Additional uncertainties cloud the estimates of gross national product. Notable among them is the fact that no one is sure of the war's effect upon man-hour productivity trends, in view of the fact that half of our current output has consisted of products that had no substantial counterpart in our peacetime price or production series.

☆ ☆ ☆

Nevertheless, despite such qualifications, it is fair to say that we do have a general conception of the magnitude of our postwar goals. Although they are well within our production potentials as demonstrated in this war, they are formidably beyond any previous record of peacetime achievement. Only the most sanguine optimism could lead one to expect that they will be achieved without concerted will, planning, and cooperative effort. Only blind recklessness could engender confidence that once attained they will automatically be held, let alone expanded in normally healthful growth.

If we were to follow past patterns, our war-built boom would, after a period of uncertain length, collapse into disastrous depression. The very magnitude of our recent growth would contribute to the depth and duration of the subsequent trough. Yet a fall even to the level of our previous peacetime-peak-year 1939, has been estimated by The Federal Reserve Board to imply unemployment for between 15 and 20 million persons. If human values have importance, that is something that must not be allowed to occur. If business values have importance, we must not tolerate again such losses as occurred from 1930 to 1933, when sales over the four year period were $128 billion less than would have been provided if the 1929 level had held, and corporate profits declined from more than $7 billions in 1929 to an average annual loss of $1 billion over the next four years. A repetition of these things cannot be tolerated—*if foresight and cooperative effort can prevent them.*

☆ ☆ ☆

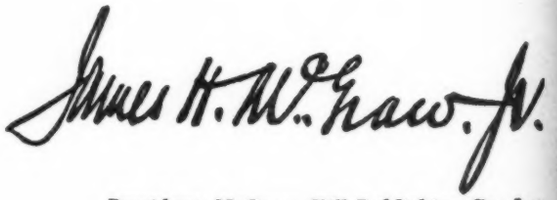
In January of this year Senator Murray introduced in the Senate a bill entitled "The Full Employment Act of 1945." It instructs the President to submit to Congress plans for eliminating both unemployment and inflation, including recommendations for correcting structural defects in the economic system. It provides for a Joint Congressional Committee to consider the proposals of the President, to take testimony from experts and the general public on these proposals or any others it may wish to consider, and after weighing all the facts to submit its findings to Congress. It provides for an advance budgeting of the constituent parts of a full-employment economy, and commits the Federal Government to provide, in advance, for sufficient expenditures (through private contractor channels) to make up for the gap between estimated private expenditures and the amount necessary to assure full employment.

By no stretch of the imagination can The Full Employment Bill, in its present form, be regarded as acceptable to business. Yet it may well present a test of whether or not American business can deal with problems in this area in a statesmanlike fashion. Such statesmanship will consist in demonstrating first, that the Bill is not acceptable because of deficiencies which preclude the possibility of its accomplishing the avowed purposes; and second, that business is able and anxious to offer constructive suggestions for remedying these deficiencies.

It is easy to point to weaknesses in the Bill. To mention only a few of major importance: The proposal to make advance Federal expenditures to compensate for estimated deficiencies in prospective private expenditures is completely impracticable. No one in the country can predict future trends with sufficient accuracy for this purpose; no one can tell what the constituent parts of a really high, *stable* peacetime budget should be, for in our boom-or-bust economy we have no stable pattern to project; no one can tell, within reasonable limits, how much the government should spend *in advance* to assure full employment. The Bill pronounces labor's right to work without defining commensurate responsibilities which it should exercise. It does not define the areas of proposed government expenditure in such a way as to allay business fears of government competition or the general public suspicion of leaf raking. Above all, the Murray Bill is defective in that, despite a somewhat vague pronouncement in favor of forwarding private business activity, it recommends a single specific designed to supplement such activity rather than stimulate it.

The very definition of certain of these faults suggests their remedies. But the positive task of stating how the Bill should be amended in order that it may have effective usefulness is far from simple. Yet it is enormously to the advantage of American business to undertake it. Fortunately, there is a representative group sponsored by industry, The Committee for Economic Development, which has for some time been working intensively upon the problem, and which is excellently equipped to offer sound and progressive advice. It should be used for this purpose.

American business cannot afford to take a negative attitude toward legislation in this field. Some legislation undoubtedly will pass, for the problem is one in which there is a grave government responsibility. But equally there is a comparably important responsibility upon all citizen groups. None of them has more to gain or lose from the rise or fall of prosperity than American business.



President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 34TH OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

Stop Private Taxation

A form of private taxation which should have been nipped in the bud was born some months ago when the manufacturers of sound records agreed to pay a labor union a royalty on each record produced. It is a kind of tax that must not be allowed to go on. If Petrillo gets a royalty for records, Lewis wants it for coal. If Lewis gets it for coal, why not Murray for steel, Thomas for automobiles, somebody for bathtubs? All goods and services could be privately taxed in the same manner.

The Petrillo-Lewis method is the same thing as taxing the people of the country, because at least part of the tax must be added to the prices the people pay for the products on which the royalties are collected. The mildest objection to this form of tax is that, if all goods and services were so taxed, there would come into being a higher cost of living to offset the increased income of everybody, and the net result would be an added burden of cost accounting and bookkeeping, useless in the extreme.

The royalty clause as offered by the United Mine Workers of America is worth careful examination. Technically, it is offered as part of an "agreement," despite the shotgun characteristics of the situation:

"For each ton of coal mined, for use or sale, the producers thereof, by agreement, shall pay to the United Mine Workers of America in behalf of its members a participating royalty of ten (10) cents per ton.

"Such royalty shall be deemed partial compensation in equity to the mine worker for the establishment and maintenance of his ready-to-serve status, so vital to the profit motive of the employer and so imperatively essential to public welfare.

"Funds resultant from accrued royalties will be available to the union to provide for its members modern medical and surgical service, hospitalization, insurance, rehabilitation, and economic protection."

Note that the royalty funds are to be available to the union to provide hospitalization, etc.; but note also that they can be used as a strike fund or to carry on whatever program the union leaders (Lewis for the present) consider "economic protection." The royalty is not sought in the interest of getting out more coal; the tons of coal per miner per unit of time already are determined.

The precedent being set—of employer perpetuation of employee unions by the method of private taxation—is dangerous. The employers would be setting up a fund which would enable their employees to carry on a strike. Where numbers of workers were large, and the industry was essential (such as coal), the government eventually would take over if the employers held out. As indicated by past events, the strikers would be given what they were striking for after the government had made a show of force, a procedure that actually would penalize the employers. At any rate that is what would happen in wartime. At the moment no one can predict what would happen post-war.

One thing is leading to another in this land of the free so far as labor matters are concerned. We have seen some fine examples of subterfuge in getting around the national policy of economic stabilization. Wage rates can't go up, but travel time and lunch time can be paid for. Vacation pay is a convenient expansion member of the anti-stabilization structure. And now we have discovered the "fringe" and "royalties."

The Petrillo-Lewis kind of levy should be outlawed. If employers cannot successfully resist it, Congress should take action before it becomes so thoroughly entrenched that a vote against it will be political suicide. I believe enough Congressional leaders are in a mood to do something if industrial management will show them where this new kind of goose-killer is going to lead.

L C Morrow

Labor Skates or Labor Statesmen?

Skates are many, statesmen are few. But management has the power, if only it has the patience, to induce a better quality of labor leadership. That is the consensus of a "roving panel forum" made up of well-known experts in both management and labor. Rule One, these experts agree is: "Learn how to distinguish between labor leaders; they *do* differ greatly"

CHARLES B. COATES, Associate Editor, *Factory*

THERE'S A REAL STORM BREWING on the labor front. No one simple expedient will solve all the complex problems that confront industry. But—

"A vital first step in successful labor relations today is recognition of the principle that management has everything to gain from close and patient study of labor leaders and their ways. Many disputes arise from internal union politics rather than genuine 'worker' issues. Ability to distinguish between them can make important, and often decisive, differences in management policy."

That's the consensus of topflight management men—and labor leaders, too, for that matter—with whom I've talked in recent weeks. My assignment, in fact, was this: (1) Go from place to place—New York, Washington, Detroit, Chicago, Cleveland, and other cities; (2) talk to industrial executives, labor leaders, writers, commentators, government officials; and (3) learn something, anything that might prove helpful in the coming crisis.

This report, then, amounts to a sort of roving panel forum. And most of its members agree that *even the best-intentioned labor leader has to be a sort of quick-change artist occasionally*—in order to keep the belligerent rank and file from falling into the hands of ultra-militants and radicals.

Why the A—— Company Goes Along With Jones

Our first witness is an official of the A———— Corporation, a big league heavy goods outfit with far-flung branch plants and a large, well-manned labor relations staff.

"We have a labor leader named Jones," he says. "Jones is no marvel, but he's pretty conscientious and has struggled hard to enforce the no-strike pledge. Yet every now and then a 'quickie' will break out in one of our plants and good old Jones will disappear completely.

"Now we happen to know that the stoppage was stirred up groundlessly by Jones's rival for power in the union, Brown. He's always watching for a chance to show his militancy and denounce Jones to the rank and file as a management stooge. Jones, correctly judging that the strike isn't really popular or basic, gets out of sight and lets the onus fall on Brown.

"So, instead of making things hot for Jones, we go along with him. Of course, if the thing spreads too far, we yell for him until he comes a-running. But it boils down to this: We *know* Jones and, tough as he is, we won't consciously do anything to discredit him or strengthen Brown's hand. We reason that post-war we'll get along better with Jones."

This simple story bristles with important implications. It was chosen, in fact, from a whole hatful of outwardly more impressive examples. By far the most exciting thing about it is its typicality. Now what do the experts find in it?

1. Complete acceptance by the management of the idea that unionism is here to stay. Some managements may not be overjoyed; they may have moments of wishing wistfully that the labor movement would dry up and blow away. But they *know* better.

I have seen confidential top management memos on the policy of some of America's foremost corporations and I beg to report—in the face of many loud *no's* from the labor side—that management men are definitely cutting their cloth for continued collec-

tive bargaining in hard-headed awareness of labor's power under a labor government. The possible exceptions are few and rare.

Yet many labor leaders are "selling" the idea that management is gathering its forces for a heavy counter-offensive against unionism as such. Some are undoubtedly sincere in this belief. Others may merely be using it as a hobgoblin with which to scare the rank and file into support of their policies.

2. A growing awareness that labor leaders do differ greatly. The old frontier maxim that "the only good Injun is a dead Injun" wasn't really valid, even in its time, except when applied to Indians as a temporary phenomenon. For those who had either to fight Indians or *live with them* as a matter of daily necessity, a more analytical approach was required.

Big outfits like the A———— Corporation are taking the trouble to distinguish between Jones and Brown today because they are determined to "live with the Indians." A better understanding of them then becomes paramount.

How important is this principle?

"We have a local that's hardly had the ghost of a walkout since long before Pearl Harbor," says a management executive in a big durable goods company. "Now you might say, on the strength of this, that here at last are the perfect labor union and the perfect labor leadership.

"But we know better. That local is communist-dominated through and through. At any time that further production doesn't suit Russia's convenience, all hell may break loose.

"We'd certainly be foolish to base much policy on the outward evidence, wouldn't we?" (See "The Problem of the Party Liners," page 86.)

3. A growing conviction that management policy can, in time, bring about an improved quality of labor leadership.

"This is just a little thing, I suppose"—another management man speaking—"but when collective bargaining overtook us about 1939, after a long, bitter struggle, believe me, our early negotiations were like a convention of Kilkenny cats.

"Everybody pounded the table, shouted—and got nowhere. One day we decided we couldn't outshout those boys, so we took a new resolve. Thereafter we held our tongues and our tempers in check. By slow degrees we have gotten a steadily more pacific attitude from them. Today our meetings are conducted, regardless of disagreements, in an atmosphere of gentlemanly quiet. I think this has made a definite improvement in the whole character of our labor relations."

Now let's give a labor leader in a nearby city *his* chance to comment.

"Right," says he, "but the process is a mutual one."

4. A widening suspicion that many labor leaders aren't really leaders of labor at all and that they follow quite as often as they lead, reflecting the temper of their constituents like so many aldermen.

"Oh Lord, how I wish that just once our union leaders would back us up in disciplinary action," sighs a Detroit executive, "but they're scared to death of the rank and file. We had a wildcat strike in one of our plants. The union heads agreed absolutely on the guilt of the ringleaders. But when it came to taking the necessary disciplinary action, they washed out on us completely."

For the negative, a prominent union leader replies:

"Sure, but look how often management puts it all up to us to get them back to work. Just last week there was a wildcat strike over a racial issue at Smith-Jones, Inc. I went out there with an Army officer, and we begged and pleaded for hours until the men went back. But did we get any help from the management? Not a bit. They just washed their hands of the whole matter."

Even the best-intentioned labor leader has to be a quick-change artist occasionally

Has Industry *Three* Elements, Not Two?

Nevertheless there is much evidence to support a new view of the human elements of industry, commonly labeled "management" and "labor". *Perhaps there are really three—management, labor leadership, and the worker himself.*

In the nature of things, full-time labor leadership tends to fall into a separate category—cross between a

profession, a fraternity, and a big business. High office in a union means desk work, dignity, authority, ample traveling expenses, and other executive trappings which the holder is humanly loath to trade for his old place on a factory floor.

Not in the least uncommon are cases like this:

Local leader Z——— flatly refuses to do a day's work in the plant, and does his utmost to prevent anyone else from doing one, either.

Everybody wearies of him, including the workers. Finally he is fired, for lots of good reasons, following elaborate government hearings. And what happens? The fraternity takes care of its own. Z——— is given a soft job on the payroll of the international union.

This particular trend is less management's problem, of course, than that of the idealistic and sincere union leaders who deplore such things. Here is something else for them to worry about:

"We're in much closer touch with our employees today than the local leaders are," runs a familiar management comment. "The leaders are too busy administering affairs in their downtown offices. There's a gap a mile wide between them and their own shop stewards."

But some managements *do* worry about this:

"Many unions, the big, new CIO types especially, are really too democratic for practical purposes," company representatives say frequently. "If they weren't roiled up by annual elections, their leaders would get a better chance to lead."

All of which, say other managements, is neither here nor there. It's things as they are that you've got to face—with all the patience and diligence which you would bring to any of the less emotional, if no less intricate, management problems that come up from day to day.

Studying Leaders Like Watching Goldfish

Is there any earthly way of classifying the genus labor leader by species? Only the boldest soul would generalize very freely with this or any large group of human beings. One of the first things you learn, in fact, is that there are no hard-and-fast rules, no blacks and whites, no fixed yardsticks for measuring the over-all character of a labor leader.

For one thing, it's too much like watching a bowlful of goldfish. A man may be an utter labor skate in a given situation and rise to the majesty of a labor statesman in another.

"Here's a labor leader," says a spokesman for a nationally known concern, "who handed our company one of the dirtiest double crosses I've ever seen. He agreed to a certain proposal in private, and then without warning blasted the living daylights out of us publicly. Yet he has given us one of the best strike records in the industry. He has done a fine job for the people he represents, but he drives a fair bargain and believes in a fair day's work for a fair day's pay. He's utterly honest personally, and by sheer force of leadership he has beaten back a radical faction in his union whose triumph would be a tragedy to the industry and the nation."

For that matter, a labor leader may be a hero to his own constituents one day and a heel the next. John L. Lewis, founder of the CIO and its idol until 1940, is one of its most hated enemies today. For years he hurled abuse at his lost love, AFL, which he now seems about to rejoin. For infinite variety, of course, Lewis has no equal. A lifelong Republican, he became a New Dealer in 1936, and a Republican again in 1940. How "classify" *him*?

Four Principal Types of Labor Leaders

Just to make a start in this study, I drew up four rough categories of labor leaders and showed them to various men in management and labor. Here they are—and in italics is the consensus concerning them:

Generalizing about labor leaders is much like watching a bowlful of goldfish . . . most observers agree today that labor leaders do differ greatly and that a study of them is rewarding to management

Type 1. *"Still unhappily rare." Estimates vary from 1 to 10 percent.* Labor leaders who sincerely believe in industrial harmony and take a long-range view of their responsibilities. They have faith in the political and economic system under which we live and they work honestly for increased worker productivity as a means to greater prosperity for the worker, the industry, and the nation as a whole.

High union office means desk work, dignity, authority, ample traveling expenses, and other executive trappings . . . Many managements report that union leadership is getting out of touch with the worker

Type 2. *"This type greatly predominates." Average estimate: 80 percent.* Those with a much narrower concept of their mission, with no very special capacity to administer, think, or lead. They have no particular program except to stay in business and hang onto their jobs, but neither have they any basic, implacable grudge against management or the present economic system.

Type 3. *"Relatively rare but influential out of all proportion to their number."* The out-and-out radicals whose first real objective is the revolutionary overthrow of capitalism and the seizure of government. To them unions are just a means to the end of totalitarian power. Of such are the avowed "party line" communists who follow Earl Browder and also the lesser revolutionaries — extreme socialists, IWW's, Trotskyites, anarchists—who, a few in number, quarrel terribly among themselves.

Type 4. *"Luckily small in number in the manufacturing industries."* The plain racketeers who do nothing for labor and nothing for industry but victimize both.

Majority May Swing in Any Direction

And on this the experts also agreed:

"Type 2 is the big question mark. Outside influences can swing a Type 2 man into any of the other three categories. Management usually has the power, if it has the patience, to get something close to Type 1 performance out of a Type 2 man or to make a Type 1 man grow in his place."

Here a nationally known labor leader in Washington begs leave to comment. He is an outstanding progressive who abhors restrictive practices, dislikes the closed shop, and believes firmly that industry has only scratched the surface of labor-management cooperation.

"You tempt me to classify management," he says. "I know some Type I managements who really understand collective bargaining, in letter and spirit. But the great majority belong to Type 2—they're resigned to it, but they don't understand it and they don't work at it half hard enough. Then you have Type 3, constantly sniping and fighting a rear guard action. And there's Type 4, the really hard-boiled managements who are out to get as much as possible for as little as they have to pay.

"It's discouraging when a Type 1 labor leader meets a Type 3 management. In one case that I know of, a union proposed a plan for speeding up production of a vitally needed war material, involving a good deal of overtime, some of it at straight time. Three managements welcomed the idea. A fourth company rejected the plan because it was union-sponsored. This same management refused to have anything to do with War Bond, Red Cross, and plasma drives unless it could name non-union workers to the committees."

I could have reminded him of the labor-management committees that broke up because labor representatives demanded overtime for attending meetings. Then he could have reminded me of labor committeemen by the thousands who put in long hours of their own on production drives. And that argument could have gone on forever.

"I'll tell you what I mean by really working at labor relations," he said. "A certain company had a lot of labor trouble. A new labor relations man came in. The first thing he did was promise the union that no grievance or dispute would go unattended for more than a few hours. They were skeptical, but they took him up on it. In his first 30 days he got hardly a wink of sleep. But after that they were convinced of his sincerity and things went smoothly. And here's another thing: I have seen a strike started by a *voluntary* wage increase. Why? Because the management didn't stop to explain it to the union."

Fear Is Real Basis of Problems Ahead

If a Type 1 labor leader and a Type 1 management were to sit down and look into the future, they would find fundamental problems to challenge their best and most cooperative efforts. *One and all, the experts see plenty of labor trouble in the near future.* The no-strike pledge has kept the lid precariously screwed over an explosive situation. Now, as the German war nears its end, uncertainty is growing and the pressure gage is mounting, pledge or no pledge.

There are dangerous "gulfs"* between management and labor, but if you had to put up the ingredients of the coming explosion in one bottle, you would probably label it "fear."

First there is the labor leader's groundless fear of an anti-union offensive by management.

Then there is the worker's fear-

*These were ably defined by General Manager Frank Rising of Automotive & Aviation Parts Manufacturers in a recent American Management Association address. Rising's thought-provoking analysis is reported in FACTORY (December, 1944, page 244).

The Problem of the Party Liners

TICKLISH AND CONTROVERSIAL is the question of communism in labor unions. Yet an unemotional understanding of the problem was never more needed.

Just now the communists are being very good boys, of course. Russia needs our production. But their one eventual aim, regardless of deviations, is the seizure of totalitarian power and the destruction of individual liberty.

We are speaking now of the "party line" communists who follow Earl Browder in his allegiance to the Russian world communist organization. The "party liners" are far more numerous and influential than the countless competing smaller sects who profess other brands of Marxism.

How to identify a communist? It isn't easy. Matters have been complicated by the too-frequent use of the "red" label in strikes. Many innocents have thus been damned. And today most union leaders have a clannish tendency to protect other labor leaders who are called "communists" by outsiders—just as *all* management men resent it when *some* management men are called "fascists."

Nevertheless, every honest non-communist labor leader who finds "party liners" in his high command will admit privately that he faces a real problem. It is something like having gremlins for co-pilots. They gyrate unpredictably in response to commands from without. They are *for* his policies one minute and *against* them the next. They are constant only in their never-ceasing snatches for power and in a certain consistent, long-range endeavor to foment distrust of the established order.

Communists are not to be confused, however, with the merely "militant" labor leader who fights management in and out of season without any formal social or revolutionary reason for doing so. Just now, for example, the communists are heart and soul for the no-strike

inspired mood of belligerence, restlessness, suspicion, hostility to all authority. War-created "easy money" is a pleasant drug, but we face an early return to the realities of competitive production. This will be a jolt to millions of workers—to some managements, too—and the fear of cutbacks, layoffs, and "speed-ups" is indeed a grave one.

There is finally the CIO's pronounced drift to the left in national and international politics. Here again fear doubtless plays its part because the CIO has special reasons to dread wracking readjustments, unemployment, and conflict between races and classes. In a contracting economy it will lose membership and become vulnerable to raids from rival unions.

Hence CIO is all-out for every plan of tax spending that will force government-guaranteed "full employment." It brushes aside all warnings that such a course may lead ultimately to the nationalization of industry and totalitarianism. Of a piece with this is CIO's new international alliance with British and Russian labor (which AFL angrily spurns).

That's "at the top," of course. A shrewd commentator, well grounded in labor affairs, points out:

"All this global stuff is very little business of the local labor leader. He doesn't give a hang for world trade union congresses, the poll tax, and so forth, unless he's especially social-minded or definitely radical."

In the field, undoubtedly, the basic quarrel will be—not wages, hours, grievances, or any of the obvious things—but *individual worker productivity*. It's the old battle of "less work for more money" *versus* "more work for more money still." Few managements today plan or hope for lower wages. But many, as a matter of survival, are going to have to insist on higher man-hour output.

The managements that do so insist —and any labor leaders who attempt to support them—are going to find themselves in the position of trying to take a bone away from an angry dog.

Just how strong is the slowdown today? The evidence is wildly conflicting. Out of the notes at hand, I could easily write a sweeping condemnation of labor or—since both sides have a human tendency to air each other's dirty linen—of management. Trying to strike a balance is another matter.

"Certainly you can't discount the importance of worker attitudes, conscious or unconscious," says an experienced industrial engineer.

He told of a company that operates identical plants, one in Detroit and the other in a quiet, settled town in an agricultural region. Products, equipment, methods, all exactly the same. Average man-hour output: Twenty-five percent *less* in riled-up, rambunctious Detroit than in the peaceful little city whose workers haven't been conditioned to constant suspicion and strife.

Slowdowns and Quarrels Over Rates Frequent

As you go along, you hear of a plant in one city that charted its assembly-line power consumption and found positive evidence of a daily slowdown in the first and last hours of each shift. You hear of a quarrel, in another plant, over unit production standards. The union held output to 40 units, the management asked 60. When three men quit, high school girls were hired—and averaged 103 units on the same operation. On the other hand:

"Sure, I want to work," a midwestern factory worker told me. "I've got two brothers in the war. But look, I make parts for a line of six men. Right now I'm a week and a half ahead."

"Does your foreman know that?" I interrupted.

"Certainly not," was the reply. "He'd cut my rate if he did."

Whether that is so or not, the important thing is that the worker *thinks* it is.

"The failure there," observes a production executive in a big automo-

pledge, whereas the non-communist ultra-militants of the John L. Lewis type are not.

Nor are communists to be confused with the sincere, non-communist labor leaders who have supported the no-strike pledge as a matter of patriotism. It isn't easy to differentiate, but here's a fairly reliable litmus paper screening:

1. Did the individual oppose defense preparations in 1940? Was he hell-bent for strikes, and dead set against the first Selective Service Act and Lend Lease, while Germany and Russia were "friends" under the non-aggression pact?

2. After Germany invaded Russia, did he go all out for aid to the Allies (but especially Russia), and for war production? Has he zealously kept the no-strike pledge ever since? Did he shriek for a second front in 1942? Does he support national service legislation now despite the opposition of most of organized labor?

If so, he's a party liner or an indistinguishably reasonable facsimile thereof.

AFL cleaned house on its radicals years ago, of course, and now hurls the "red" charge at CIO. But it takes real courage for a CIO leader to denounce communists publicly, particularly those in his own union.

Samuel Wolchok, national president of the United Retail, Wholesale, and Department Store Workers, did that very thing not long ago. His target was a unit of his own union, big New York Local 65.

Detailing his charges, Wolchok declared that in 1940, the New York Local attacked the European conflict as a "phony" war and took up the Browder slogan, "The Yanks are not coming." It further declared: "Every big industrialist, every bloated banker . . . is clamoring for America to get in the war."

Then came the German invasion of Russia. The New York Local became rapidly pro-war and supported every sort of war regimentation. It has not since been excelled in its abhorrence of all strikes. Local 65 was, in fact, the only labor organization to issue a "condemnation" of the parent union's Detroit strike against Montgomery Ward & Company.

tive plant, "may very well lie in lack of foreman training."

This particular witness has some very definite views on management's solution of the problems to come. Let's hear him out:

"We're not going to have to take the bone away from the dog," he says. "For many years we've had incentives based on time study in which union participation is a first principle. The idea of a better day's pay for a better day's work has been *sold* to the employees by the union, as much as by us. As a matter of fact, our union leaders have even sold the idea to other unions in other plants.

"When you stop to think of it, the impulse to slow down—because of fear of unemployment—is basic even among non-union workers. And union organization is one of the first expressions of that fear. The answer is to remove the fear and erect in its place a sense of security and individual progress. With the right union leadership stimulated by the right management policies, this can be done."

Government Intervention Called Stone Wall

Now when you analyze this entire report, you find signs throughout industry of a more analytical, less emotional approach to labor relations. Management is working harder than labor may admit at the job of making collective bargaining work.

Yet one senses—for it is implied as often as it is expressed—that management faces one virtual stone wall—namely, constant government intervention on the side of labor. No matter how wisely and carefully management plays its cards according to Hoyle, the other fellow has unauthorized aces up his sleeve.

But even this discouragement doesn't produce utter hopelessness in the management men who face facts as they are. Many companies now make it their aim to settle disputes in the plant and at the local level. Occasionally one hears of labor leaders, too, who agree that too much dependence on government will weaken labor eventually.

Not long ago I talked to a man whose name is nationally revered in labor circles, although he himself is disturbed by the trends he finds in the labor movement he helped to build. I asked him what one thing, what single piece of advice, he would give to management in the coming crisis.

"Just this," he replied thoughtfully. "Tell them to keep out of Washington if they can. Management can't win there."

This will evoke hearty amens all over industry. But in the plants one hears a note of hope expressed by those who feel that management can yet recapture the confidence of its own employees.

"We believe definitely," says a mid-western corporation executive, "that a broad program of industrial and public relations *can change minds*. If—in all the ways, little and big, that really count—we give the worker a sense of security and individual dignity, we shall be ready for an effective program of employee education.

"This will, in turn, induce a more cooperative attitude in union leadership—or change that leadership."

He and his company will have a hard row to hoe. He's dealing with an entrenched, hostile, ultra-militant union leadership with an almost psychopathic hatred of management and a messianic gift for rabble-rousing. Yet he has confidence in what FACTORY has so often called "the long hard job of good employee relations." For he has seen results.

This won't come overnight. It can't be done by putting a box in an organization chart. It costs money and it calls for a new spirit in the management organization from top to bottom. Nor does it mean a namby-pamby "caving in" to labor's every demand or a surrender of management's rights. That's the easy way, and the right way—says our witness—is the hard way.

"But," he concludes, "it's never too late to begin."

How Traveling Stockrooms Solved a Layout Problem

LEWIS K. URQUHART, Managing Editor, *Factory*

WATCH the "traveling stockroom" in post-war industry. Often praised in the past, but seldom installed, it is now being used so successfully in war work by so many plants that it bids fair to become standard practice as the return is made to peacetime operating conditions.

Case in point is supplied by National Cash Register Company, Dayton. Here the technique has been given a thorough workout in the assembly of B-24 and B-29 carburetors, with such outstanding success that already it has been adapted to the assembly of one regular peacetime product—a large accounting machine which is being made for the armed services—and will be used in the manufacture of other well-known NCR products as soon as change-overs from current wartime output are authorized.

Advantages

The "traveling stockroom" is, of course, nothing else but a conveyor that stores parts as well as moves them.

There are four such conveyors—total length, 1800 feet—in the NCR carburetor assembly department, all of the overhead-cable-trolley type, and all so carefully integrated with floor conveyors of the belt and roller variety that the end-result is a well-articulated handling "system" (in the same sense that the N. Y. Central is a system), which provides the following benefits:

1. Eliminates manual transportations. All movements of parts, subassemblies, or completed carburetors between operations are made mechanically. Nowhere in the department (420x75 feet) does an assembler or a subassembler waste a single step in the transportation of work.

2. Minimizes handling at the workplace. Work is delivered by conveyor directly to the point of use, is taken away by conveyor as units are completed. Never does an operator have to move a part of a subassembly, or slide a finished carburetor, more than the foot or two between conveyor and working position. This is especially important because most of the operators are women, and some of the parts and subassemblies are heavy. The finished B-24 and B-29 carburetors, which have to be moved through testing and wiring operations, weigh 36 and 50 pounds respectively.

3. Saves floor space. There are no temporary storages, no floor-level banks between operations. Operators pick what they need off the conveyors. Conveyors remove completed work. Estimates of additional space that would be required by any other type of layout run from 25 to 40 percent!

4. Assures steady flow of work. Delivery promises may be kept because parts flow through subassembly, and subassemblies move through final assembly, exactly as scheduled. There is always approximately 4 days' work ahead on the conveyors. If shortages appear imminent, there is always time to put the pressure where it is needed. Operators never have to sit around and wait for parts to be delivered.

5. Guarantees flexibility of operation. Schedules can be stepped up or down as needed. Assembly lines can be switched to handle a similar product or changes in the manner of

Girl in stockroom loads stock conveyor with castings used in subassemblies. Carrier trays are marked with parts numbers. Carriers are painted blue or gray to help workers on subassembly lines locate parts they need. Note that parts on carriers at girl's right have already made circuit. Conveyor holds approximately four days' work

Over-all view of department at National Cash Register Company where carburetors for B-24's and B-29's are assembled. It was taken from northeast corner looking diagonally across to south wall (see layout sketch on following pages). Conveyor in foreground is finished unit conveyor which descends at this point to be loaded with completed assemblies destined for delivery to final assembly line

processing the same product without altering the set-up. Stock is merely taken from overhead stock conveyor, assembled into a subassembly, put on belt conveyor to travel down to the inspection bench, whence it goes back on overhead conveyor to final assembly.

6. **Facilitates layout changes.** There is nothing hard and fast about this type of layout. If for some unavoidable reason it became necessary to move a certain subassembly from the northeast to the southwest corner of the room, the change could be quickly and simply made. The conveyors used here are easy to install, easy to take down. They can be shortened or lengthened almost at will. Changes of direction offer no obstacle.

7. **Avoids congestion.** Traveling stockroom conveyors make use of "air rights," are up out of the way when serving merely to store parts and subassemblies. They descend to convenient work level to deliver or pick up parts. Aisles are kept free and clear for pedestrian traffic.

8. **Aids good housekeeping.** There is no need to keep anything on the floor—and nothing is kept there. It is thus easier to keep this department clean than it would otherwise be. Tile floor—the room used to be a cafeteria—is mopped twice a day. Cleanliness is especially important because of the precision type of work involved.

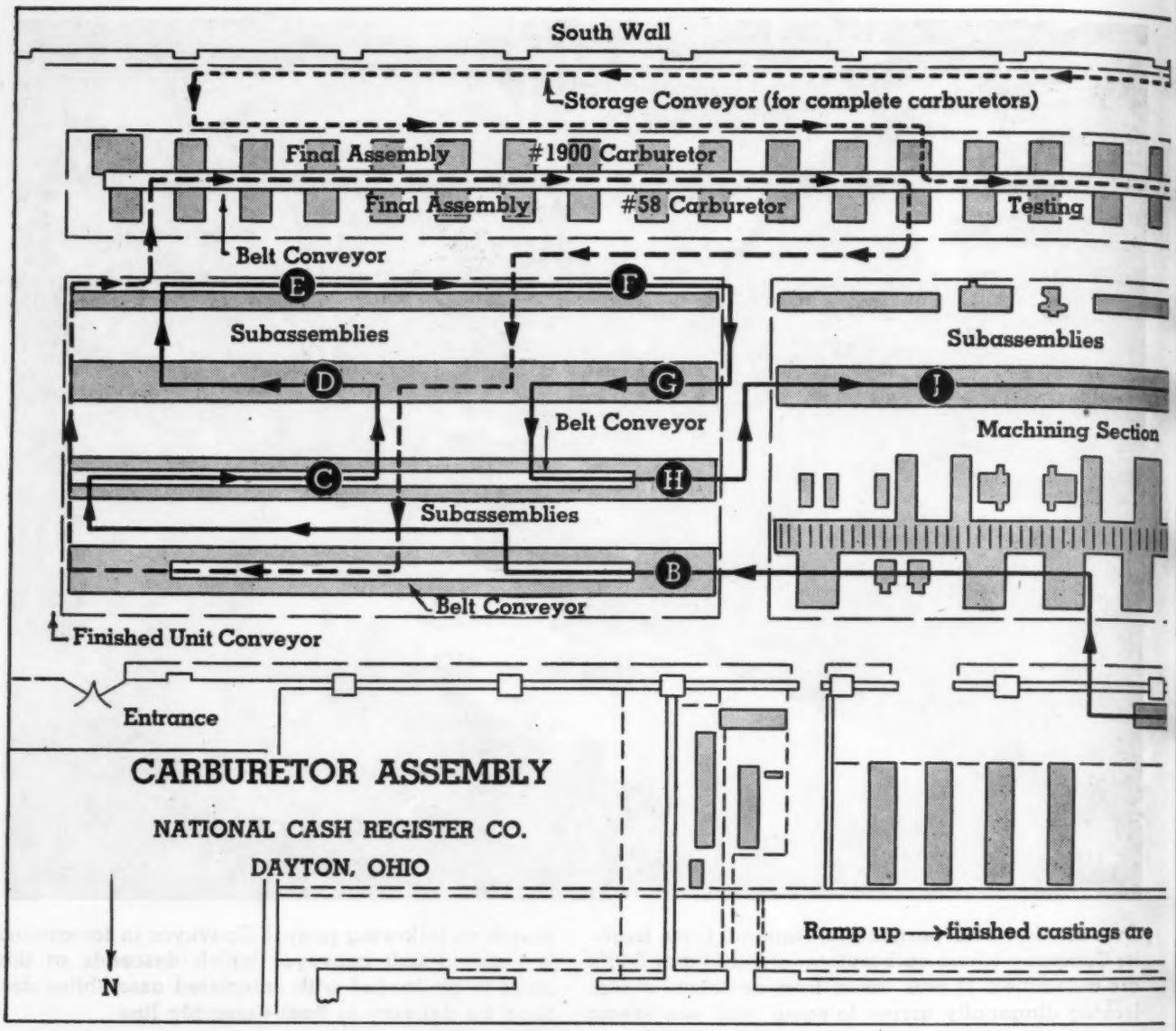
9. **Gives stock-handling economy.** It takes only 3 horsepower to run 1800 feet of conveyor. At 1 cent per kilowatt, 2238 watts per hour gives an hourly cost of 0.02238 cent for trucking against the pay for three full-time truckers without the stock conveyor.

The four overhead-cable-trolley conveyors and their functions are: (1) *Stock conveyor* which moves castings from stockroom to subassembly benches; (2) *finished unit conveyor* which picks up completed subassemblies and delivers them to the final assembly lines; (3) *storage conveyor* for finished carburetors; (4) *wiring and shipping conveyor* which takes finished carburetors through the section where bolts and other fasteners are wired for safety's sake, then on to the shipping department.

A brief description of the conveyors will illustrate how the system operates:

1. **Stock conveyor.** Finished castings are power-trucked from other buildings via tunnel and ramp (see accompanying layout plan).

This conveyor is equipped with 4-tray sheet-metal carriers, 7 inches square, of welded construction, with edges turned up to prevent parts from sliding off. Carriers are hooked through trolley eyes, are easily (and

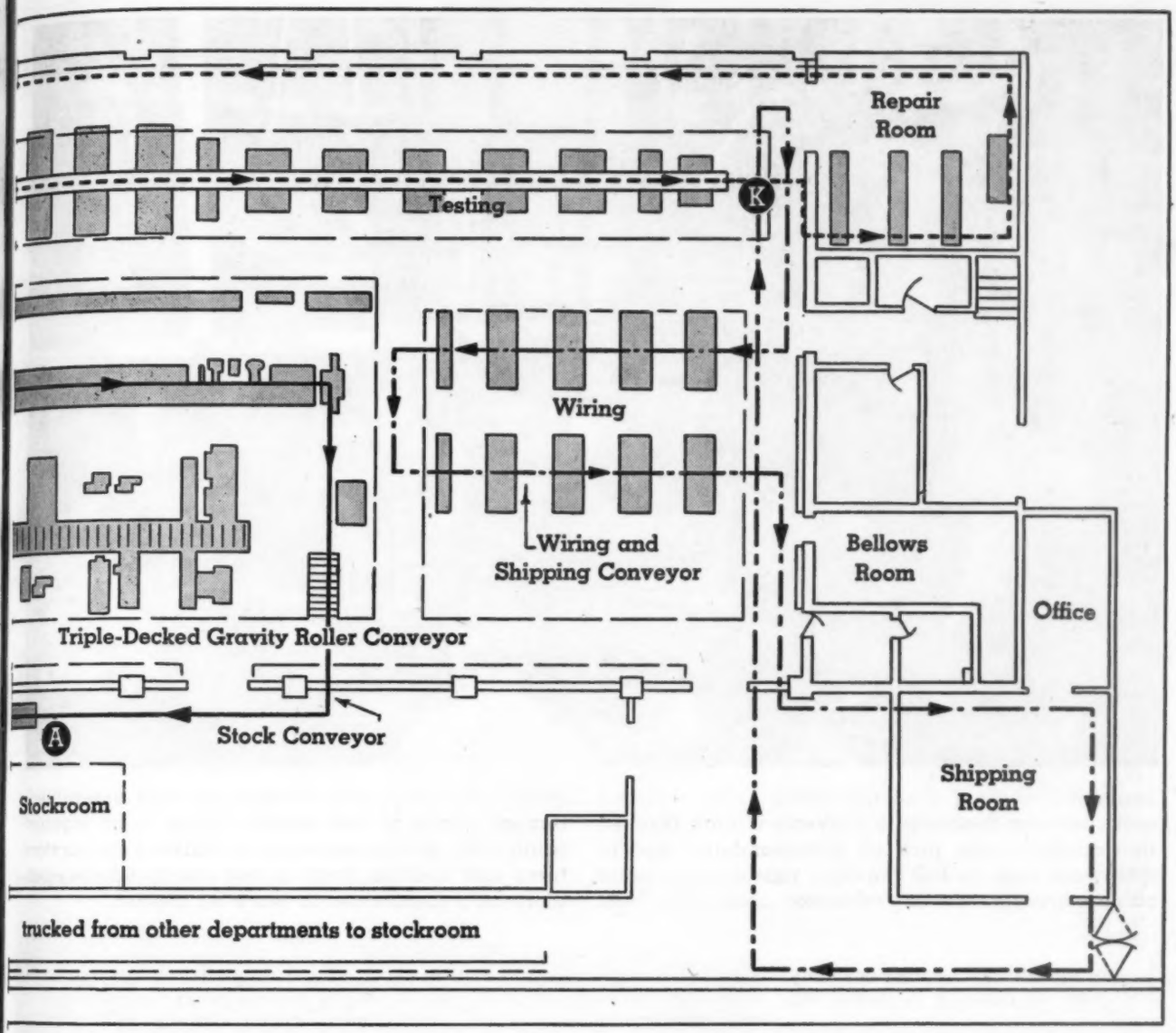


Close-up of workplace on a subassembly line. In background, stock conveyor which doubles as transportation unit and storeroom

often) removed for cleaning purposes. There is a carrier on every other trolley; in other words, carriers are suspended on approximately 2-ft. centers. This distance between carriers is necessary; otherwise carriers would "interfere" when the conveyor ascends or descends. Rate of travel (same for all four conveyors) is 12 feet per minute.

The stockroom (again see layout) is located adjacent to the assembly department. The conveyor runs through the wall and along the wall inside the stockroom, dipping at the point marked A on the floor plan and running along at that level for a distance of 25 feet or so.

Here girls load castings into trays. Trays carry parts numbers, and each part is always loaded into a tray of the same number. Some parts are small enough so that two can travel comfortably in one tray. The girls soon get to know the sequence in which carriers move past the loading station.



Above and on facing page, simplified layout sketch of carburetor assembly department at National Cash Register Company shows how stock conveyor serves subassembly sections, how finished unit conveyor picks up completed subassemblies and carries them to final assembly lines, providing both storage and transportation. See text for complete description of how this well-articulated handling system works

It is their job to fill every empty tray –and they do, so long as they have the parts at hand. Castings are, of course, moved to the stockroom on a close schedule; the aim is to keep about four days' supply in the stockroom and on the conveyor.

Trays are blue and gray—blue for the 58 (B-29) and gray for the 1900 (B-24) carburetor. Colors are used to help subassemblies spot the parts they need.

Purchased parts—nuts, bolts, washers, screws, gaskets, cotter pins, studs, etc.—are also kept in the stockroom, but are not delivered to subassemblers by conveyor. Instead, trays at workbenches are kept filled by the stockroom girls who have plenty of time to handle this work in addition to their regular duties in the stockroom.

The stock conveyor, thus loaded, now ascends to its high level, moves back into the assembly department, cuts east through the machining section (about which, a note later), descends at the point marked *B* on the layout where operators remove castings needed in fuel end plate, pressure end plate, and idle valve subassemblies for both 58 and 1900 carburetors.

When this delivery has been made, once again the conveyor ascends, swings away from the bench, cuts down the aisle, swings across to the second subassembly where, at *C* it descends and delivers castings for throttle bracket and vapor trap units.

Similarly, at points *D*, *E*, *F*, *G*, *H*, and *J*, the conveyor makes deliveries to other subassembly sections, after which it returns to the stockroom.

Note that belt conveyors run down the middle of two of the benches—or rather they crawl, since the rate of travel is 10 feet per hour. Finished work is carried away by these slow-motion belts, which are provided because metal finishes must be preserved. Subassemblies made at other benches are of such nature that they can be shoved along, so conveyors are not necessary.

2. **Finished unit conveyor.** With the problem of moving parts to subassemblies solved, it then becomes necessary to get finished subassemblies to the final assembly lines. This is done by a second overhead conveyor, also equipped with 4-tray carriers. The latter, however, are all painted gray

Beginning of final assembly lines. Here finished unit conveyor descends to convenient work level so that operators can pick off subassemblies used at their work stations. Belt conveyor runs directly under cable conveyor, moves carburetor assemblies from station to station, and, when completely assembled, through series of test stands. Upper right, against south wall, storage conveyor for finished carburetors turns and doubles back to test stands where operators help themselves to work as needed

because operators on the final assembly lines have no difficulty in identifying units.

For convenience in following the path of this conveyor in the accompanying sketch, it may be picked up at the east end of the bench where the subassemblies started at *B* are completed. Here the conveyor descends to pick up finished units which are loaded by the inspector at the end of each subassembly line. Like the one just described it stays up out of the way while merely perfomring the storage function.

All subassemblies are placed in cellophane bags to make sure they arrive at final assembly stations without picking up even a speck of dust or dirt. Some of the subassemblies are small enough to fit into trays; others are hung by hooks from the trolleys between trays.

From the first subassembly bench the finished unit conveyor swings south and passes the end of each of the other three benches at the east end of the room. At each of these spots it takes on stores, then moves to the beginning of the final assembly lines where it swings west and travels at work level between the two rows of work stations.

When the conveyor has served the final assembly lines, it ascends, doubles back to the middle of the second and third subassembly benches where it dips each time to be loaded with subassemblies produced on the western halves of those benches. It then moves back to the inspection point on the first bench and so completes the circuit.

It will be noted that the conveyor does not serve the bench marked *J*. Instead, subassemblies produced here are loaded back on the stock conveyor and taken to *C* where they are attached to the subassembly made at that point. Incidentally, the work done at *J* is purposely isolated from the other subassemblies because a small amount of grinding has to be done, and even though it is done under water it is kept as far away from the other work as practicable. The location of this work serves further to emphasize the flexibility of this type of handling system; the conveyors can go anywhere they are needed to do a job.

It will also be noted that a belt conveyor runs between the two rows of work stations on the final assembly lines. Operators remove subassemblies from the finished unit conveyor and add them to the carburetor assembly which moves via belt from station to station. The belt conveyor extends on down to the end of the room, carrying carburetors through a series of test stands where altitude and temperature control valves are set and adjusted, synthetic rubber diaphragms are exercised, and flow of gasoline is checked under a wide variety of operating conditions.

Normally, assembled carburetors stay on the conveyor belt and are moved directly through the testing operations, but to prevent congestion at the test stands the third traveling storeroom has been provided.

3. Storage conveyor for carburetors. This conveyor is like the first two described, but since it carries finished carburetors it is equipped with special carriers (see photograph on page 93) which are suspended from every fourth trolley. It moves directly over the

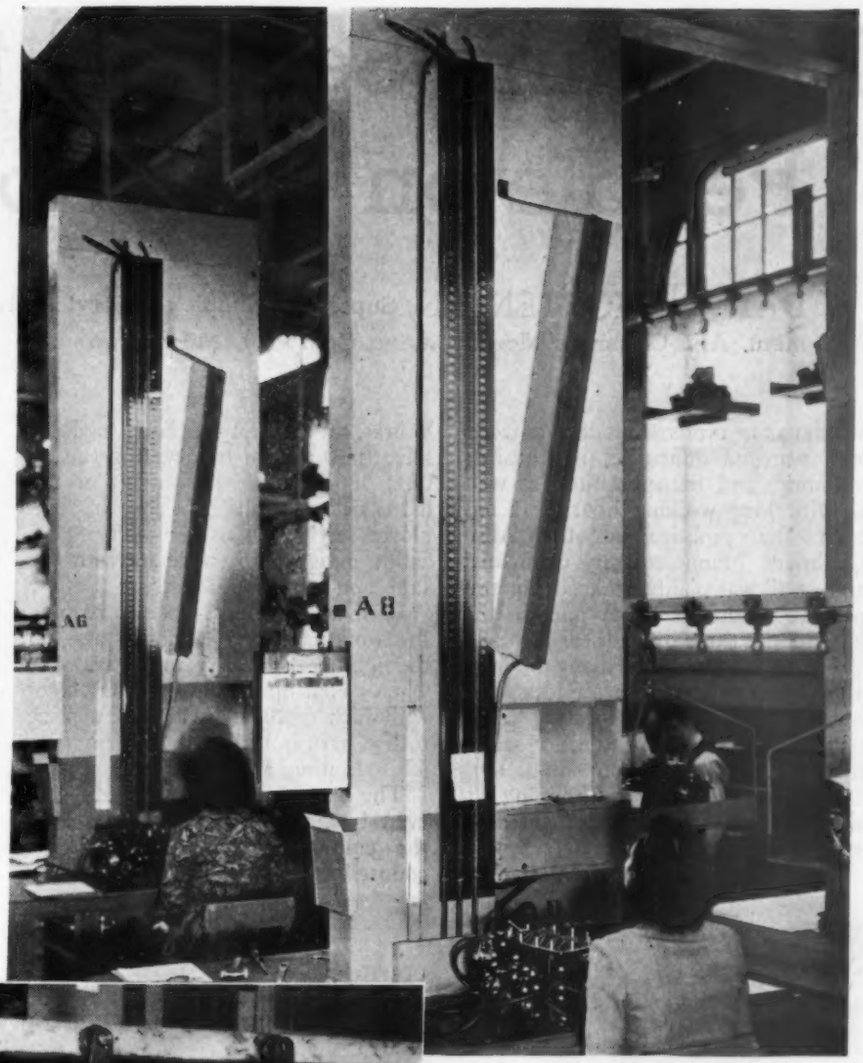
belt conveyor down through the test stands, through the repair room at the west end of the building, doubles back at high level along the south wall to the beginning of the final assembly lines, turns again, parallels the assembly lines as far as the inspection point, turns and descends there, thereby completing the circuit.

As implied in the foregoing, rejected carburetors are taken by this conveyor from the test stands to the repair room. In most cases the repair can be made there and the carburetor returned via the conveyor to the test stands.

4. Wiring and shipping conveyor. Like the storage conveyor just described, it is equipped with a carrier designed to hold a finished carburetor. A spring-actuated safety bale makes it impossible for it to slide off.

This conveyor meets the assembly belt conveyor at the transfer point marked K on the layout. To keep the carrier from swaying as the heavy carburetor is slid aboard, there is a rubber-like flange on the bottom of the carrier which runs between guide rails both here and at work stations on the wiring line.

Carburetors are carried by the conveyor to the adjacent wiring section and from there to the shipping department. The conveyor makes the circuit

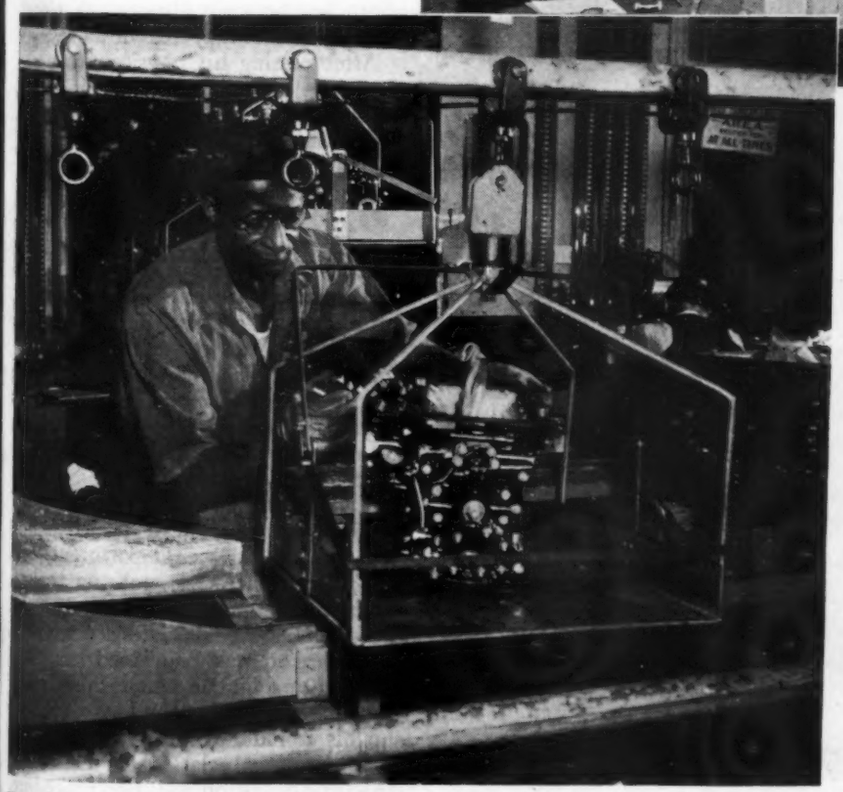


Test stands are served both by belt conveyor and overhead storage conveyor, which may also be seen against window as at high level it moves along south wall

of the latter room, then returns to the transfer point indicated at K.

* * *

A note perhaps is needed to explain the machining section located in the assembly department. As stated at the outset, finished castings arrive from other buildings ready for subassembly, so all the machining is done elsewhere except a very fussy job on valves and seats. A very fine micro-inch finish is required on these parts. Also, they have to be kept very clean. Also, they are used in the subassembly that begins at the end of the machining lines. There are three different kinds of valves, two kinds of seats. Valves move down one line of machines, seats down the other. The triple-decked roller conveyor already mentioned is used to move them from one operation to the next.



Transfer point marked *K* on layout. Here finished carburetors are loaded on overhead cable conveyor that moves them through section where nuts and other fasteners are wired, thence to shipping room

Providing Services to Keep People on the Job

DAN S. MORTENSEN, Supervisor, Employee Service Division, Industrial Relations Department, Allis-Chalmers Manufacturing Company, Milwaukee

WORKERS IN INDUSTRY today are faced with wartime difficulties in housing, rationing, and transportation, as well as with long working hours. It has been the problem of the Allis-Chalmers Manufacturing Company, and of all war plants, to keep the employees reasonably happy and on the job, despite these difficulties.

Employers have tried many different approaches. Employee services ranging all the way from locating living quarters to establishing beauty salons in plants, from furnishing sun-bathing facilities on the job to shopping for the groceries, have been instituted by various plant managements.

At the Allis-Chalmers West Allis Works, an attempt has been made to solve the problem by devoting the efforts of an entire department of the industrial relations division to employee service. This is a staff organization designed to cooperate with the shop and office management.

With the prime purpose of keeping the worker reasonably happy and on the job, the department is available when called upon to assist the worker with such problems as finding a place to live, transportation to and from his job, rationing, and tax problems.

The employee service division goes even further in the attempt to keep the employee satisfied by affording counseling service for personal and "on the job" troubles for employees, who are usually referred to employee service by their supervisors.

Another important element of the division's work is the provision of a broad recreational program. An extensive technical library is available to serious-minded employees, with technical literature research assistance for those who cannot find what they are looking for.

In addition, numerous services are given to employees entering military service; an industrial blood donor program is carried out; jury duty deferments, house building, and new car priorities are taken care of.

Recently a man from northern Wisconsin came to Milwaukee to become a war worker at Allis-Chalmers. He wanted to do his share to help the war effort, but between him and that goal were several unexpected obstacles.

After passing his physical examination and getting the job, he reported for work. Because of his previous experience in garage work, he was assigned as a helper on a machine job. But problems began to pile up.

"You were so nice to us while we were in service," say veterans returning to their old jobs at Allis-Chalmers. The employee service department sends Christmas and bonus checks, hundred of letters

Giving a Man a Break

Almost at once his foreman noticed his ability and offered him a job as a machinist. This was a real break for him, but it also frightened him. He did not want to risk failure among his highly skilled new co-workers, and he would have to purchase $20 worth of special tools and clothing.

On his first day at work, in the induction lecture room, he had heard of the employee service department, and he decided there was nothing to lose by taking his problem there.

After a short talk with a counselor, this worker was convinced that his previous machine experience made him capable of handling the job. To back up his confidence, he was enrolled in two vocational classes to teach him machine operation and shop procedure. That relieved his mind about investing the $20, but the tools were rationed.

The employee service counselor

Problems of all kinds are brought to the employee service department. Transportation difficulties are solved; suitable houses are found; necessary tools are procured—to cite but a few examples

helped with that phase of his problem, too, by supplying the necessary forms, helping him to fill them out, getting them approved, and locating a place where he could buy the tools.

All this help began to stir the new employee's interest, just how far did this "employee service" go?

He had not been able to find a house near the plant, and he wanted to bring his wife and two children down from his upstate home—could employee service help him?

The counselor thumbed through the housing file and came up with a listing card that showed a 4-room cottage a mile from work and within his price range. And another satisfied worker took his place on the production line.

In offering "employee service," the company is not engaged in welfare work or charity. It is simply concerned about relieving certain stresses among its employees brought on by the war, in order to keep workers on the job. Such services result in employee satisfaction and cannot help but develop better cooperation. Today thousands of employees depend on this department for essential help in one form or another—housing, recreation, sports, clubhouse eating facilities, rationing aid on gasoline, shoes, tools, counseling on personnel problems, rides in organized car pools, special transportation when overtime hours are put in, and literally hundreds of other services.

Arranging for blood donations is part of the service department's job. In 1944, 6985 pints were given by Allis-Chalmers workers

Also, much of the department's program is designed to detect and eliminate potential sources of friction and annoyance. By drawing out puzzled or unhappy employees, and by following up and investigating the reports of exit interviews, conditions have been uncovered that management has recognized as unwholesome, and which it has striven to correct.

By this method of operation, management performs its true function of noting and correcting bad management practice. As this service is developed

LOOKING FOR A HOUSE, APARTMENT, or a ROOM?
OVER 3,000 PERSONS HAVE BEEN ASSISTED WITH THEIR HOUSING PROBLEMS IN THE PAST YEAR— DROP IN...PERHAPS WE CAN HELP YOU!
WEST ALLIS
Visit or Call THE INDUSTRIAL RELATIONS DEPT.
Room 361-B Ext. 2341 EMPLOYE SERVICE DIVISION

A man whose family cannot find a place to live is not a happy—and therefore not an efficient—worker. Poster encourages employees to bring their housing troubles to the employee service department

and enlarged, employee dissatisfactions can be rectified before they become deep-seated grievances.

The services of the department are offered to all employees, with no restrictions or conditions of any kind. Any appearance of paternalism is sedulously avoided.

The company knows that by helping employees, it gains also, and it is the privilege of any employee of the Allis-Chalmers Manufacturing Company to discuss his problems confidentially with a representative of employee service. If his complaint is a fair one, he is entitled to proper adjustment, and if his complaint is ill-founded, he is entitled to an explanation of the circumstances. Acting in a staff capacity, the department serves as a channel of communication and understanding between employees and management.

For employees on military leave, help of many kinds is given by this department. Mailing lists are kept up for some 85,750 employees in the services. Thousands of letters are written by members of the employee service department, or are promoted by its members in the serviceman's old department.

During the past two years hundreds of bonus checks and thousands of Christmas checks were sent to men in the armed forces.

In addition, there has been a large mass of day-to-day correspondence with thousands of servicemen. In 1944, 28,198 letters were mailed. Discharged veterans already have told the employment office that an important reason for their return to their old job was the company's contact with them while they were in service.

The company has found already that this function of the service department pays excellent dividends. Numbers of discharged servicemen have returned asking for their old jobs back because "you were so nice to us while we were in the service . . . . you took such care of us while we were gone."

Other statistics on the 1944 activities of the employee service department speak for themselves:

In recreational activities, more than 2500 men engaged in bowling leagues; 800 engaged in intramural softball; 300 played golf; 275 participated in touch football; and 550 in basketball. Other activities for men included tennis, archery, boxing, dartball, softball, horseback riding, swimming, trapshooting, badminton, aviation, and the men's chorus. Clubhouse recreational parties were sponsored for both shop and office girls.

More than 5000 Allis-Chalmers families in the area received housing aid. Meals served at the clubhouse totaled 420,000, and 5500 technical books and magazines circulated through the technical library.

Reducing Gas Rations

Approximately 3000 car pools were established in a plantwide organization, and, as a result of this group riding activity, supplementary gasoline rations were reduced from 4000 to 2600 by the end of 1944. Each of these ration books required at least five handlings.

Other rationing activities included obtaining priorities for tools, issuing safety shoe stamps, fuel rations, and home remodeling permits.

The blood donor activity was under the direction of this department and 6985 pints of blood were contributed by employees during 1944, with many employees having given eight and more times.

Through the counseling service, hundreds of aliens were helped with problems such as the obtaining of birth certificates; other employees were aided on insurance and allied matters, and scores of interviews were given for personal subjects.

While the employee service department was called into existence because of wartime necessity, it has a definite place in the improvement of employer-employee relations as a permanent feature. Although some wartime services may be discontinued, such functions as obtaining proper housing facilities and employee counseling will go on.

There will also be a great deal of work for the department in assisting in rehabilitating war veterans after the reconversion to peacetime production.

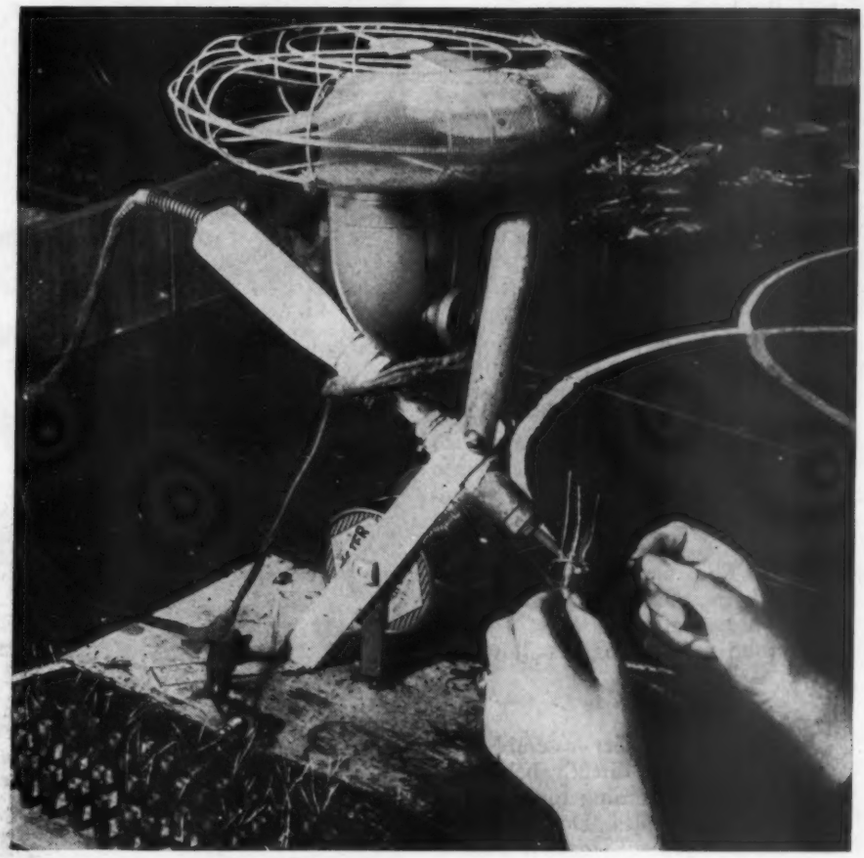
THE AMERICAN WAY

"The American System is a system of pay proportionate to productivity. And that system operates consistently in good times and in bad times; in wartime and in peacetime. It is not influenced by industrial oppression or union aggression, nor by Democratic and Republican administrations. The average income per wage earner in American factories is strictly proportionate to the values which that average worker helps to produce."

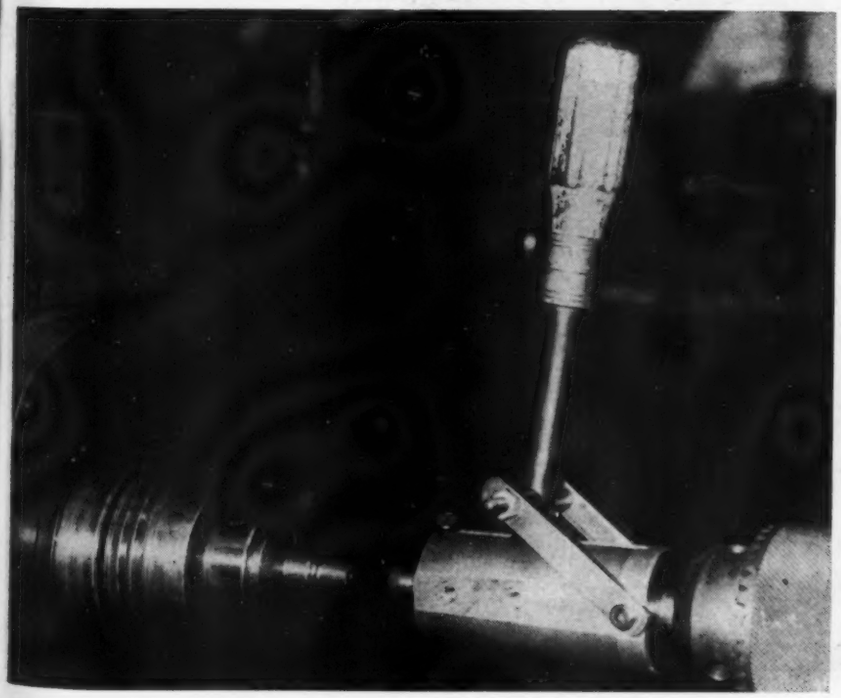
Allen W. Rucker in "Labor's Road to Plenty"

Better Methods That Add Up to High Production

Turned up on a quick tour of the Farnsworth Television & Radio Corporation's plant at Marion, Ind. They are typical of the work methods men are doing today in a thousand plants engaged in war production. They augur well for the low-cost production that will be so necessary when industry gets back to making peacetime goods



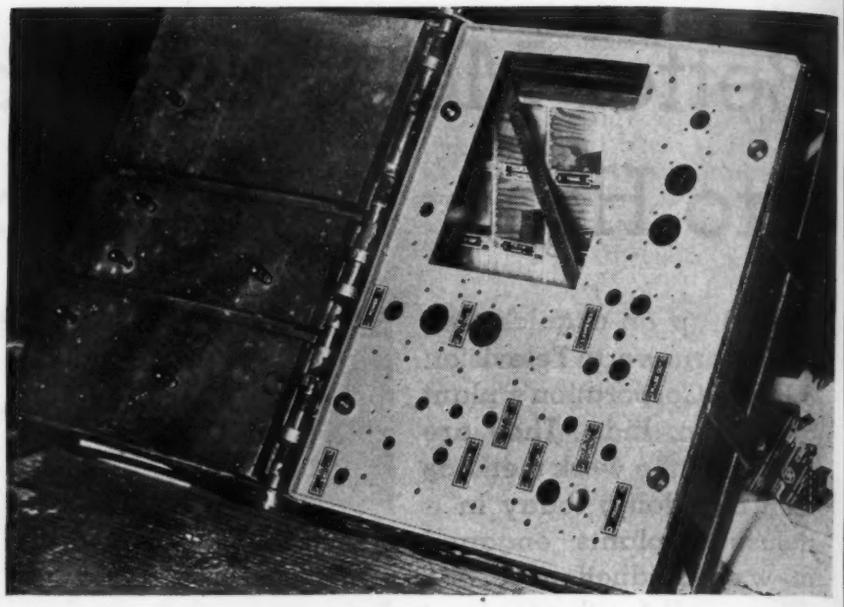
1 Soldering is easier and output is greatly increased when the workplace is set up in accordance with work simplification principles. Here the soldering iron and reel of solder are affixed to the workbench, leaving the operator's hands free to perform the operation in the most convenient working position. No fumes or smoke, by the way, so no need for a respirator. The inverted fan produces a reverse draft which carries fumes to ceiling outlet.



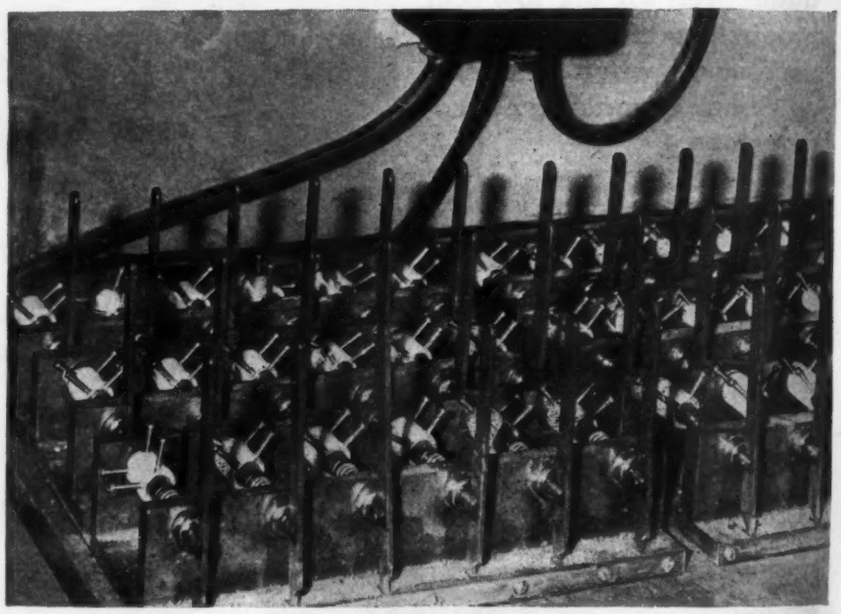
2 A 200 percent increase in production over the original tools, and a 75 percent increase over the intermediate tools, used on an assembly job, is attributed to a fixture that employs the principle of leverage. It presses first a molded plastic bushing and then a silver sleeve on a brass stud. One of the operators in the Farnsworth shop thought he could improve on the original arbor press and subsequent hand screw machine methods used to assemble this part. So he came up with the method now in use, which requires three steps: (1) Press stud into collet in lathe spindle; (2) place bushings in adapter in assembly fixture, which has been set in the tailstock of a bench lathe; (3) pull the handle back and press bushings onto the stud. That's all there is to it. The silver sleeve fits in the same adapter, and the same method is used in pressing it.

CONTINUED ON NEXT PAGE

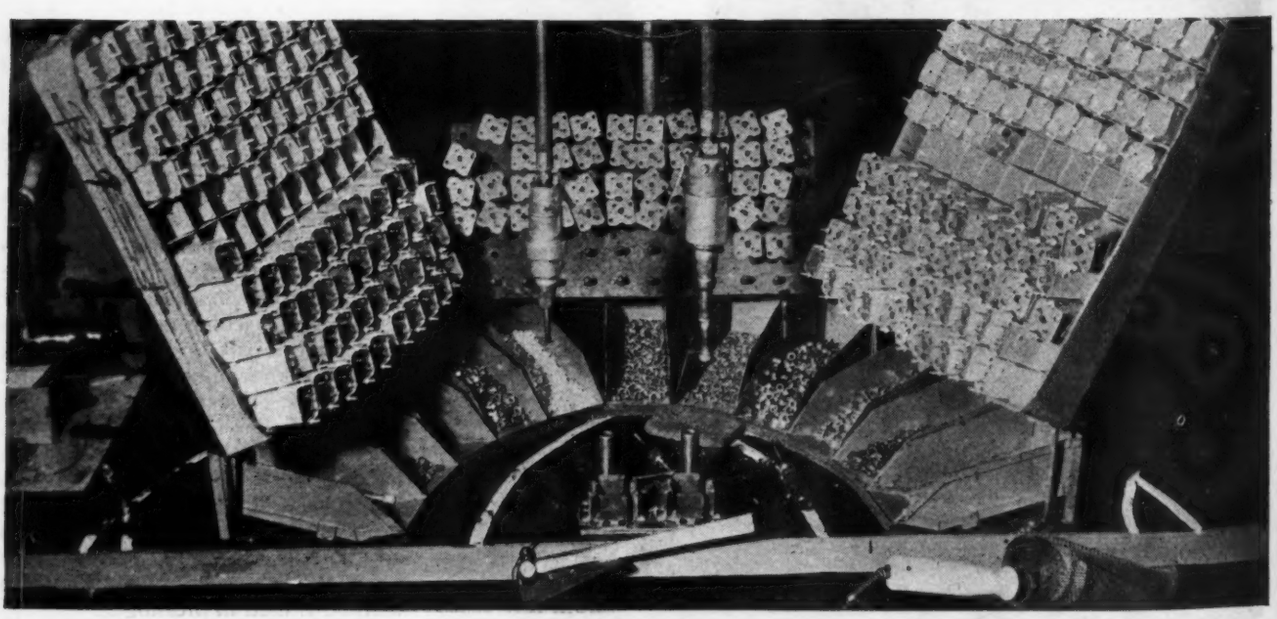
3 **Riveting fixture speeds** the fixing of nameplates to panels. Fewer operators are required. Production has been increased 150 percent over the old "hammer and dolly" method. In the new method, plates are assembled in the proper positions on the panel and held in place by dropping in rivets. The folding part of the fixture, at the left, is folded over the panel so that hardened anvils on its surface take the heads of the rivets. The entire fixture is then turned back again and the rivets are driven with a pneumatic hammer.

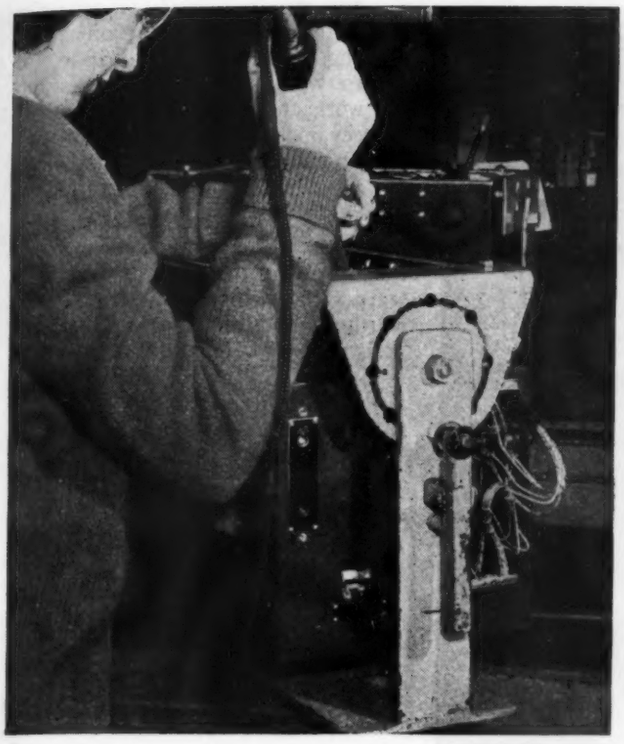


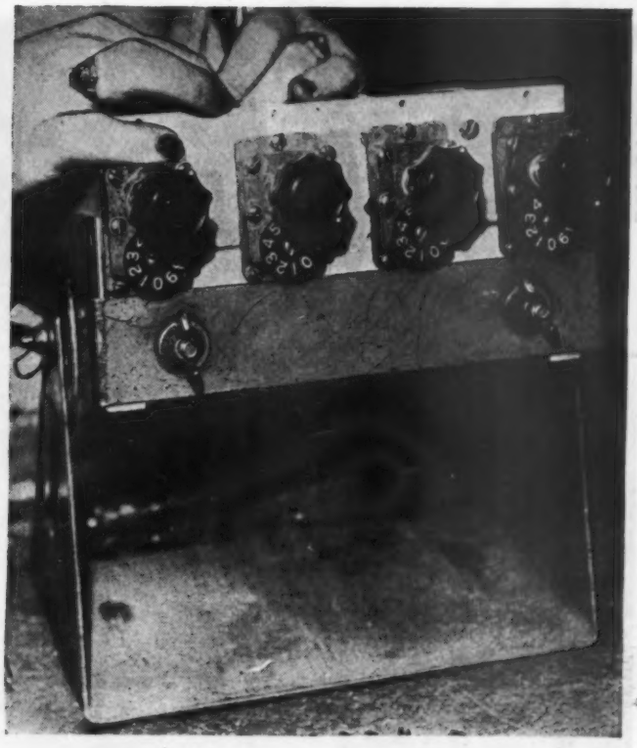
4 **A perfect union** is assured and assembly time is cut by another simple fixture developed by Farnsworth methods engineers. The job of assembling ceramic couplings is an extremely important one in certain types of transmitters. A knurled bushing must be impressed on each end of the coupling in perfect alignment, in order to forestall "whip" when in operation. Bushings are coated with a binding cement, and again the principle of leverage is used to force them into position. The couplings, after assembly, are locked in the fixture and passed into a thermal oven at 180 deg. F. This method of assembling and drying, superseding manual assembly and air dry, saves 3½ hours per group of couplings as illustrated here.

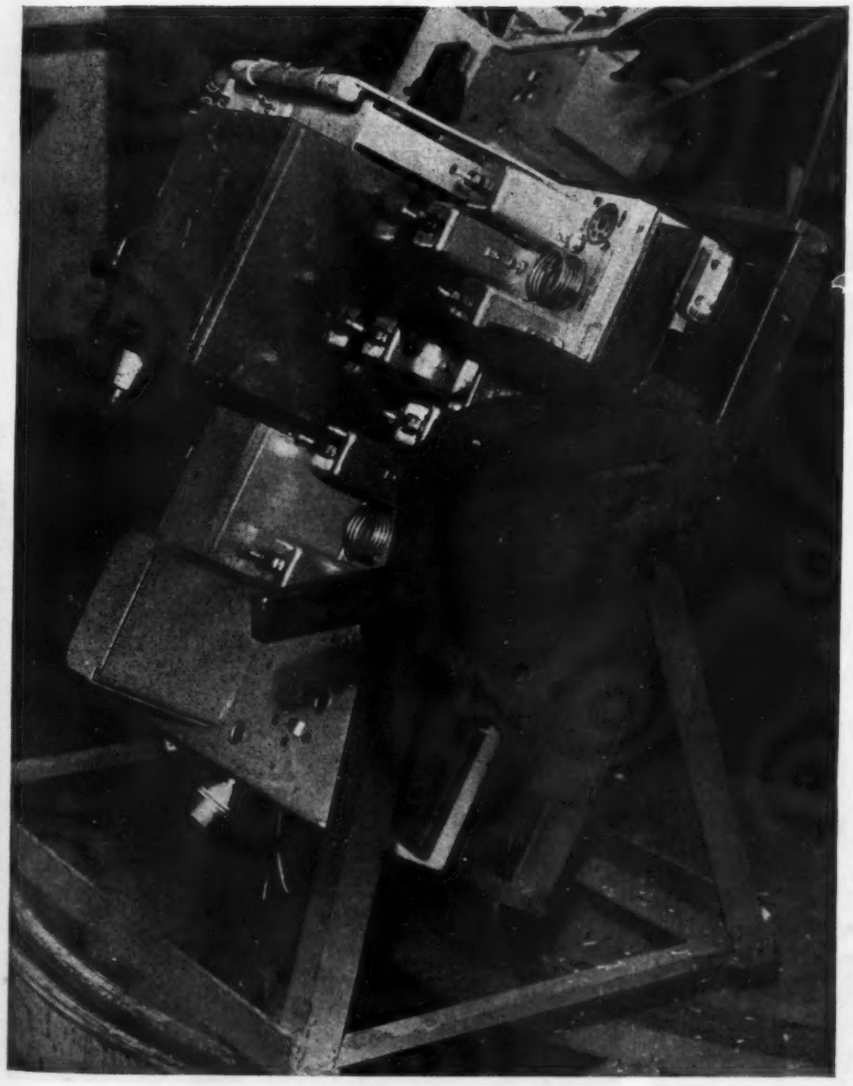


5 **For faster, easier assembly** the circular workplace directly below has been laid out according to work simplification principles. Double fixture and bin arrangements make it possible to assemble two units concurrently. Power tools are pre-positioned. Sim-







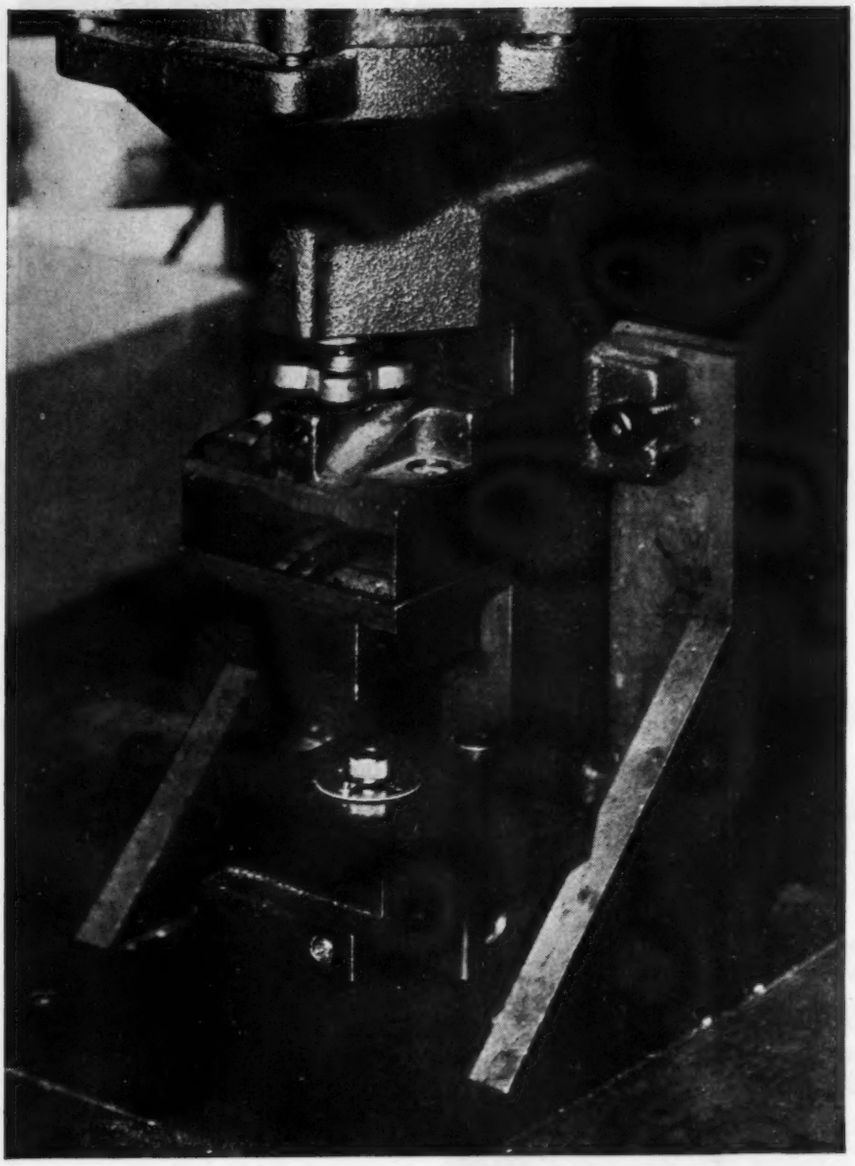


ple holders are supplied for hammer and soldering iron. Note white semicircles on bench to mark normal work area. All workplaces at Farnsworth are marked like this. The idea, of course, is to make sure work is within easy reach and to show up violations of motion economy law.

6 **General purpose fixture** (above left) can be adapted, with nothing more than the simplest sort of change to many types of larger equipment assemblies. The section of the fixture in which the unit is mounted, can be rotated and located in any one of nine desired positions. The locating is done by means of a plunger pin which snaps into the proper hole when the unit has been positioned.

7 **It cost** $2.20, including labor and materials, to make a sheet-metal fixture (above right) that can be used in a wide variety of small-part assembly jobs. On the average, its use means a 35 percent increase in efficiency. In essence it is a simple chassis mounted on a stand. The part is locked in place by the two wingnuts in the foreground. Chassis can be rotated into any working position the operator finds most convenient.

8 **Garage door track** supplies the means by which the large general-purpose fixture at the left is slid from one operator to the next in line. As in the two fixtures shown above, the rotating part of this one also can be

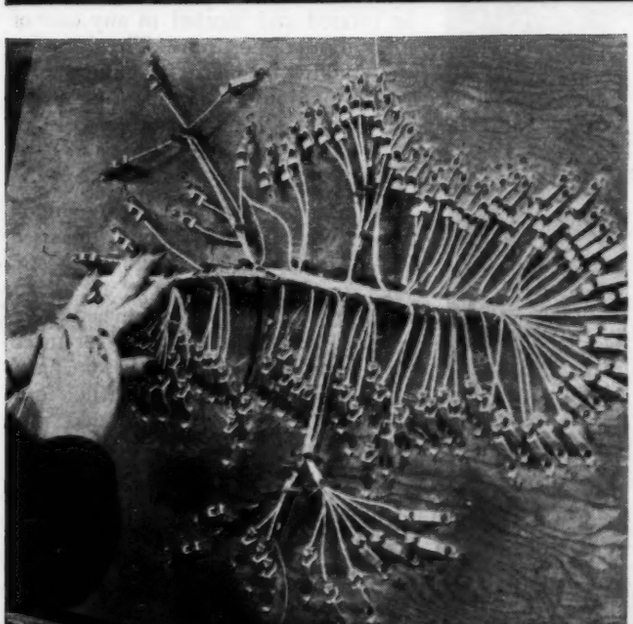


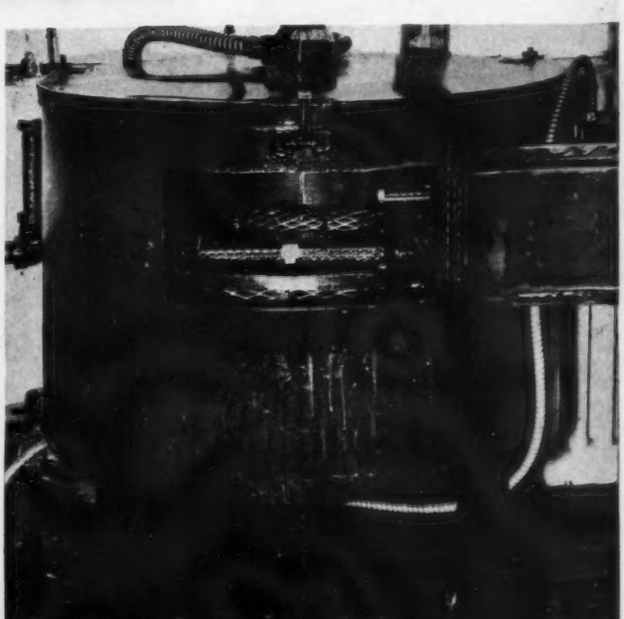
locked in a number of convenient working positions. This feature, so necessary in assembly jobs necessitating work at various angles, not only reduces operator fatigue, but also prevents possible damage to the assembly.

9 **Done in half the time.** An arbor press was formerly used on an operation involving the assembly of collars and a sprocket on a small shaft. Farnsworth methods men replaced the arbor press with a pneumatic vise, vertically mounted. A punch and die are fastened to the jaws of the vise, which is treadle operated.

10 **Subassembly lacing board** can be tilted into any convenient working position (below, left). Boards are used in assembling cables for communications equipment manufactured for the armed forces. Boards can be tilted because clamps hold the wire ends as the cable is laced together. Numbers at the end of each clamp guide the operator.

11 **Centrifugal force** is used to remove excess wax from parts that require wax impregnation. The old way was to wipe the excess wax off with a rag, which left a streaked surface and necessitated retapping wax-filled holes. Now waxed parts are placed in small wire hoppers which are evenly balanced on the wheel inside the drum. A constant heat of 235 deg. F. is maintained in the drum, and rotation of the wheel at 1750 r.p.m. removes the excess wax while still in a molten state. The wax drains to the bottom of the tank and is used over again.





What Management Should Know About Teamwork

STUART CHASE

Some workers get wrong ideas about management, and some managers get wrong ideas about workers. FACTORY believes it will be instructive, therefore, to have a neutral's viewpoint on how management and workers can collaborate more whole-heartedly. The author's long acquaintance with industrial problems qualifies him to state the case

TEAMWORK does not stop with the game of school or college. Even the best-equipped army cannot hope to fight effectively without it. And every factory, department store, railroad switchyard, is alive with gangs and teams—some obvious, some unrecognized. The fact is that teams form *spontaneously* wherever people work together. They can put a company in the red, or they can make it hum.

Although teamwork is one of the most dynamic of human activities, it is one of the least understood. As a rule, managers of industrial enterprises know little about it. Dr. Elton Mayo of the Harvard School of Business Administration, perhaps our foremost student of industrial psychology, has been trying to learn more concerning this human power house.

"At no time since the industrial revolution," he says, "has there been effective and whole-hearted collaboration between the administration and the working groups of industry."

Waste of Human Energy

As a result, a great river of human energy has been running to waste. Workers have fixed ideas about management which are normally contrary to the facts; managers have fixed ideas about workers which are normally contrary to the facts.

Here is a case taken from *Management and the Worker*, the introduction to which was written by Dr. Mayo. There are fourteen men in a room in the Hawthorne plant of the Western Electric Company, whose job is to attach the wires to part of a switchboard used in office equipment. The job is called "bank wiring." Nine men are wirers, three are solderers, two are inspectors. Looking at them another way, four are Czechs, three are Yankees, three are Germans, two are Poles, one is Irish, and one is Armenian.

Natural Leaders

These men have spontaneously formed a team, and natural leaders have made their way up. The plant's management is blissfully unaware of the strength and toughness of this outfit, which might compare with Notre Dame in its most triumphant days. The group is primarily a *social* unit, not an economic one. It is not opposed to management but indifferent to it, having more interesting matters to attend to.

The company worked out a plan for incentive pay. The more a worker turned out above a certain standard called a "bogey," the more he would earn. It was a fair plan, and the company assumed that it would increase production. Yet in the bank wiring room it did nothing of the kind. If anything, it depressed production.

The fourteen men could readily have turned out 7300 connections a day without overworking. They would have earned far more money had they done so. But they held to a flat 6000 units per day, no more, no less. This figure was the bogey above which the incentive system began to operate. If some member got ambitious, the gang slapped him down. There was absolutely no relationship between a member's output and his ability. These men did *not* act in accordance with their supposed economic interests.

Why? Because they were more interested in maintaining their team than in cash returns. Their simple code made them believe that if they exceeded the bogey, four calamities might descend upon them:

1. The piece rate would be cut.
2. The bogey would be raised.
3. One or more of the team would be fired.
4. The supervisor would bawl out slower members.

The management assumed that each employee would react logically to the incentive pay plan. But no employee came anywhere near it!

"This was a result which the management was not prepared to cope with," says *Management and the Worker*. "Any management which leaves out the feelings or folklore of the workers is incomplete and incalculable."

The whole plant at Hawthorne was found crawling with similar informal groups, lined up against "rate busters" who produced too much, "chiselers" who produced too little, and "squealers" who told on group members.

Breaking Up Teams

Time study men often try to break up teams in the hope of making workers more efficient. This results in depriving workers of the very things that give meaning to their work, and without which the best effort can never be drawn out of them.

In the light of what happened in the bank wiring room, it would appear unwise for management in any plant to make incentive plans or any other kinds of plans as if teams, or the need of the workers to form teams, did not

exist. Such teams, and their opinions and wishes, must be recognized, understood, and worked with.

Recently research men from the Harvard Business School, with Dr. Mayo assisting, have been studying aircraft plants in California. They found that miracles of production were being achieved in spurts, but that over-all performance left a good deal to be desired. In 1943 Southern California was making 50 times as many airplanes as in 1941. Labor turnover and absenteeism were very high. For example, of ten workers at their benches in January, only three were left in November. Even if the incoming seven were alert and experienced—which they were not—there would still be a loss of output as the new men were broken in. The loss would be even greater as old teams dissolved and new teams gradually formed.

Much of the turnover could not be helped. In 1943 women, youngsters, and oldsters were tackling war jobs which many of them did not need financially and did not always like. An abnormally large number of Americans were on the move that year, and nowhere did they move faster than in the Golden State.

Shortsighted Management

The Mayo study makes full allowance for the fact that labor turnover was bound to be high, even with the best of management. But management was often shortsighted. When good technicians were drafted into the Army, management keenly felt their loss. *When natural team leaders were drafted, management as a rule didn't know it.* Yet the effect of their loss on production was often greater than that of the technicians.

Here is a typical case which illustrates the point. John Briggs is a team leader in Department X of one of the big aircraft companies. Nobody appointed him. He just is. Every worker in that end of the department knows it. John goes to his supervisor to make a complaint. The supervisor looks John up and down, walks over to the file, and takes out a card.

"Do you want your certificate of availability?" he snaps.

John had no thought of leaving his job. He knows, however, that Lockheed, over on the other side of town, needs men badly. He snatches his certificate and walks out, white with anger.

He has not had a chance to tell his supervisor what he came to complain about. Maybe it was the light, maybe the washroom. He has not had a chance to tell him that it was his benchmates who asked him to complain on behalf of the team. So there is lost a natural leader—one the management did not even know existed.

John Briggs was a man who was boosting production by molding a loose collection of indvidiuals into an industrial football team. He was raising morale in his end of the shop, and was in a position to relieve the foreman of many problems of minor discipline. He was making things hum. And now he is walking out of the gate, past the guards, cursing the supervisor and the company. His team is headless, and will dissolve into its separate units. In the front office, the chart makers will presently begin to wonder why output in Department X has gone to hell.

Fortunately this does not always happen. Sometimes a wise foreman or "exit interviewer" recognizes the important place of John Briggs in plant production, and gets him back to lead the team. Frequently, however, the exit interview, made when a man is leaving, comes too late. There is only one sure way to save team leaders. That is for top management to realize that they are often the power house of the plant.

It is useless, says Dr. Mayo, for management to decide whether or not to have teams in the factory. *They will form anyway, whatever you do.* They are as natural as falling in love. Management may be able to control group attitudes, whether friendly to the company or hostile. It may be able to overcome suspicion of cooperation with management, which unfortunately is the usual attitude. Managers may sometimes choose which type of group is to be formed.

Three Types of Teams

Dr. Mayo found three types in the aircraft factories:

1. A "natural" team, with rarely more than seven members, having closely related tasks.

2. A "family" group, with as many as 30 members, in which a core of experienced workers guides the newcomers and the less experienced.

3. An "organized" or company group, deliberately set up by management to encourage and use the team instinct—a group that can be even larger than the "family" type but which requires at least six months to establish.

When these three are accounted for, there will remain the "irregulars," the men who can't or won't make the club. An intelligent "organized" group will try to get in as many of them as possible. *The greater part of absenteeism and turnover comes from the ranks of irregulars.* They have found no social life in the factory, and so have nothing to hold their loyalty.

One of the "organized" groups was discovered statistically by research men who were plotting curves that showed rates of absence. When the curves were abnormally high or abnormally low, further investigation was made. One day a curve turned up that was a honey. Most of the workers in that department were in the class of only one absence a year or less! On many occasions employees in that department had come to work so ill that they had to be sent home. A bunch of regular teacher's pets! What was the matter with them?

How a Leader Works

The matter was that a rank-and-file supervisor—call him Ralph—had mastered the team idea, and had organized a gang with himself as leadman. He was a college-trained chap with a good deal of industrial experience and a knack for handling men. He acted as troubleshooter, contact man in the relations of his group with higher-ups and with outsiders, and as general guide, instructor, and father confessor to everyone on the team. Top management was unaware of the whole thing.

Ralph took especial pains to start a new man off on the right foot, with a long friendly interview, a warm introduction to his future buddies, and a tour of the plant, particularly the assembly line, so that the newcomer could see exactly where his work fitted into the completed battle plane. After the newcomer had watched the part he was going to make being installed in the final assembly, he realized how much his country needed him.

Group members brought their troubles to Ralph—factory troubles, home troubles, girl-friend troubles. When they thought they deserved a raise, they persuaded him to ask the boss for it. They worked hard because they felt good about working. Their efficiency was rated 100 to 105. The plant average was 80.

Dr. Mayo's assistants also ran into the type of manager who did not believe in teamwork. He was afraid of it. He preferred to deal with his workers one by one, and distrusted any tendency to form cliques. The teams formed, of course, and were mostly hostile. Plenty of irregulars were left over; they sent absenteeism and turnover rates sky-high, because irregulars

do not discipline themselves as do team members.

These West Coast aircraft factories were not old-fashioned companies; they were new, and strictly up to the minute in technology. Managers were open-minded, as a rule, and willing to cooperate with Dr. Mayo's men. They had extensive personnel programs, with athletic fields, recreation halls, day nurseries—"everything but bullfights." Without such programs, turnover and absenteeism would doubtless have been still higher. In fact, managers had every aid modern science and social work could bring them, *except the knowledge of what makes men work.*

Now let's jump 3000 miles and watch Dr. Mayo's men on the Atlantic coast, where industrial discipline has been much longer established.

In a certain New England town there are three metal-working plants. They were all founded a generation or more ago. They are about the same size; they share the same labor market and general conditions beyond the plant gate; they all make the same type of castings. Yet in 1943 the casting departments at Smith's and at Jones's had absence rates *three times as high as Robinson's.*

A Controlled Experiment

Industrial psychologists of the Harvard Business School were asked to find out why. It was a pretty little problem—what scientists would call a "controlled experiment." With outside conditions practically identical, with output about the same, the research men could only conclude that the difference in absenteeism must be due to *inside* conditions—that is, to management.

On arrival they were met with a carload of explanations, especially from Smith and Jones. The favorite explanation was that highly paid war workers liked to go on weekend binges, followed by blue Monday and a rest cure. You probably heard of such cases yourself in 1943. You remember how high feeling ran; how cartoonists pictured soldiers dying at the front because a riveter took a day off; how the very name "war worker" became almost a term of reproach.

An analysis of the records showed several interesting things. First, new employees in the casting department had a higher absence rate than "veterans" of a year or more. Among the veterans, unnecessary absences were confined to one worker out of ten. It follows that generalized criticism about sozzled war workers was grossly unfair to at least 90 percent of all regular employees. Again, the absence rate in the Smith and Jones companies was not only higher than for the Robinson company, but it fluctuated much more widely in response to external changes such as a new federal or state law about overtime pay.

What Robinson Does

As the research men dug deeper, they found the Robinson management doing the following things which were quite unknown in the casting departments of Smith or Jones:

1. A new Robinson employee was initiated with great care. He was received by a special section, then passed on to his foreman-to-be, and then to a special coach—an older employee assigned to show him the way around.

2. The foreman continued to take an interest in him—in fact, the chief records of attendance, days off, skill, and so forth, were kept by foremen.

3. Instead of a permanent foreman, each employee dealt with all the foremen in the casting department. There were four of them, and this unique procedure seemed to work extremely well. One reason was doubtless the great care the company took in training foremen, not only in the technical skill of tending hot furnaces, but in human relations.

4. Although hours of work were somewhat shorter at Robinson's, they had been increased, of course, above peacetime levels. Sunday work was assigned so that each worker took his turn, but he always had one day off in seven. He knew his schedule far ahead of time; he was permitted to trade days off with his companions; if he failed to appear on his assigned Sunday, he was laid off on Monday.

5. Incentive payment was by a group system, groups consisting of a furnace line, with all three shifts included. This put a premium on working the furnaces at capacity.

6. This payment system, together with the shift arrangements, encouraged the men to *work as a team.* They themselves put pressure on fellow-members to come to work regularly. Here we have the reverse of the bank wiring room. Here management was aware of the team instinct, and deliberately fostered it.

Any one of these measures may seem small, but added together they spelled loyalty, enthusiasm, and high morale, as shown in the low absence figures.

The investigators noted that a labor-management committee at Smith's was trying to cope with absenteeism. They also noted that communication between top and bottom was poor. For instance, a sensible suggestion which employees had made to their foremen, about changing an antiquated announcement system which encouraged absenteeism, was never passed to the higher-ups, and was never acted upon.

A man does not go to work in the morning so much because he wants to win the war single-handed as because his companions in the plant expect him to be on the job. They will think less well of him if he runs out on them—and the normal man has a strong desire to be thought well of by the others in his social circle. The fact that his social circle is in a factory does not make it any the less binding. When most of one's days are spent in a factory, that is where most of one's social life is carried on.

As was noted earlier, teams are sure to be formed spontaneously if they are not specifically encouraged—and a spontaneous team is much more likely to have a don't-give-a-damn attitude toward the job than a positive, enthusiastic attitude.

Challenge to Management

The more we see of these careful studies of Dr. Mayo and his associates, the more clearly do they appear as a challenge to management. The techniques of human relations are concrete and measurable, but are not pills to be swallowed in the expectation of instantaneous cures. They require patience, wisdom, and continuous follow-up. The Robinson company, for instance, had been following up for 20 years.

Hiring personnel directors is not enough. Installing foreman-training courses is not enough. Labor-management committees are not enough. These are all good methods which have worked well in various instances, but they are feeble things *unless top management is active in making them work.*

Not only must the big boss take a direct personal interest in these matters, but he must establish a free and fast communication line from the lowliest worker right up to his own desk. Above all, in order to get that wholehearted collaboration between management and worker which Dr. Mayo calls for, the boss must understand the vast human dynamo involved in teamwork. If he can enlist its aid, the increase in both factory morale and output is well-nigh unlimited.

Supervisory Incentives Make Foremen Managers

J. M. DRULINER, Chief Industrial Engineer, Consolidated-Vultee Aircraft Corp., San Diego

AN INCENTIVE PAYMENT PLAN now in operation in all manufacturing and modification divisions of the Consolidated Vultee Aircraft Corporation rewards the responsible supervision for success achieved in improving costs and maintaining them at reduced levels. Known as a Supervisory Cost Conversion Incentive Plan, it is credited by top management with indirect responsibility for having increased appreciably the corporation's "realization" (or efficiency).

Advantages of the Plan

Increased efficiency is attributed to the plan because it:

1. Provides a constant incentive for the supervisor to improve existing conditions and performance.

2. Encourages cooperation and coordination of effort between factory departments.

3. Keeps supervisors constantly on the alert for new ways to get the most out of direct labor hours through better methods, better training, better relations.

4. Helps make foremen and supervisors in the lower echelons feel they are definitely part of management.

5. Provides management with a coordinated picture of progress—a picture by means of which it can do a better job of controlling.

All salaried supervisors below the level of assistant division manager are eligible as soon as operating controls have been established on the functions for which they are responsible.

How Plan Is Applied

Five factors are used in applying the incentive plan both to direct and indirect departments:

1. Departmental realization
2. Plant average realization
3. Housekeeping
4. Safety
5. Meeting schedules (for department managers and higher only)

1. Departmental realization is expressed as a percentage representing the actual performance attained by the department as related to its established standards. Incentive earnings are based on the comparison of the present period's performance with that of the previous period, or month, as shown in the departmental operating report (Figure 1).

For maintaining departmental realization, 10 percent of the previous month's realization percentage is allowed, with a minimum of 4 percent and a maximum of 10, provided the current month's figure is not less than 3 percent below the previous month.

For increasing departmental realization, ½ of 1 percent is allowed for each point gained over the previous month.

Here are two examples of these calculations:

First example:

Departmental realization	
This month	38.55%
Last month	35.86
Gain	2.69%
For maintaining (minimum of 4%)	4.00%
For increasing, ½ of 2.69	1.35
Total	5.35%

Second Example:

This month	75.21%
Last month	77.56
Loss (less than 3 points, no penalty)	2.35%
For maintaining 10% of 77.56	7.76%
For increasing	0.00
Total	7.76%

Examination of Figure 1 shows that, for the department in question, this month's realization is 56.8 percent compared with 55.2 for last month. Each participant is therefore allowed 10 percent for maintaining last month's percentage, which is increased by 0.8 percent (one-half of 1.6), making a total of 10.8 percent for departmental realization.

2. Plant average realization is expressed as a percentage representing the actual performance attained by the plant as related to its established standards. The percentages used are calculated from the totals of all participating departments. Incentive earnings are based on a comparison of the present period's performance with that of the previous period. Consequently only departments participating during both periods are included.

In other words, total standard dollars are added for all participating departments, and the sum is divided by the sum of the total actual dollars.

Example:

	Standard Dollars	*Actual Dollars*
Department A...	$ 31774	$ 34267
Department B...	98052	116971
Department C...	81703	114948
Department D...	362863	394612
Department E...	21497	29027
Department F...	92111	164979
Department G...	99370	119727
Department H...	3560	4842
	$790930	$979373

$\frac{790930}{979373} = 80.76\%$ plant average

For maintaining plant average realization, 5 percent is allowed each department if the current month's plant average is not more than two points below the previous month.

For increasing plant average realization, one-half of 1 percent is allowed for each point gained.

First example:

Plant average realization	
This month	80.76%
Last month	75.40%
Gain	5.36%
For maintaining plant realization	5.00%
For increasing, ½ of 5.36	2.68
Total	7.68%

DIRECT DEPARTMENT OPERATING REPORT

Dept. No. 36 — Period 11-November
Dept. Name Sheet Metal Shop — Week 5 of 5
Building No. 1 — Plant No. 1 — Department Head John Doe — W. E. 12-3-44

Classification	AMOUNT IN DOLLARS			PERCENT REALIZATION		
	Standard	Actual	Variance	This Week	Period to Date	Previous Period
DIRECT LABOR ON STANDARDS						
Model— Dive Bombers						
Model— P-38	1,268	1,815	547	69.9	69.9	70.9
Model— B-24	2,673	5,542	2,869	48.2	47.6	45.3
Miscellaneous						
Total	3,941	7,357	3,416	53.6	53.4	53.1
DIRECT LABOR NOT ON STANDARDS						
Productive	25	47	22	53.6		
Tooling	4	7	3	53.6		
Total	29	54	25	53.6	53.4	53.1
TOTAL UTILIZED DIRECT LABOR	3,970	7,411	3,441	53.6	53.4	53.1
UNUTILIZED LABOR						
Training	31	57	26	53.6	53.4	53.1
Overtime Premium	372	552	180	67.4	68.0	68.2
Night Shift Premium	145	197	52	73.6	76.0	75.3
Extra Work	101	189	88	53.6	53.4	53.1
Rework	84	156	72	53.6	53.4	53.1
Idle Time	52	98	46	53.6	53.4	53.1
Rate Variations	-0-	257	257	-0-	-0-	-0-
Total	785	1,506	721	52.1	52.0	51.9
INDIRECT LABOR						
Supervision	706	981	275	72.0	76.0	75.3
Clerical	77	90	13	85.6	78.3	72.1
Sweepers	160	185	25	86.4	85.6	77.9
Other Indirect	54	66	12	81.9	87.0	88.3
Total	997	1,322	325	75.4	78.3	76.8
INDIRECT EXPENSE						
Operating Supplies	163	268	105	60.8	65.0	62.7
Maintenance Supplies	26	41	15	63.4	68.4	70.0
Perishable Tools	148	164	16	90.2	78.0	75.5
Total	337	473	136	71.2	74.1	73.4
ASSIGNED INDIRECT LABOR						
Inspection	487	505	18	96.4	87.6	72.0
Production Control	30	48	18	62.5	67.8	68.6
Timekeeping	43	50	7	85.8	84.6	69.5
Maintenance	183	230	50	79.6	70.0	67.5
Total	747	833	93	89.7	86.0	70.2
TOTAL DEPT. LABOR AND CONTROLLABLE EXPENSE	6,832	11,545	4,716	59.2	56.8	55.2
FACTORY AVERAGE PERCENT REALIZATION				46.0	45.3	44.8

Figure 1. Supervisors' incentives at Consolidated Vultee Aircraft Corporation are based on four factors, two of which are obtained from departmental operating reports. To compute incentive payments in the case illustrated, each participant is allowed 10.8 and 5.25 percent respectively for maintaining and increasing departmental and plant average realization. Housekeeping and safety are the other two factors on which incentives for supervisors below the level of department head are based

PLANT HOUSEKEEPING RATING VALUES

		Poor		Fair		Normal		Excellent
Conformance to Layout and Equipment Standards	Shop	11	16	20	23	26	28	30
	Office	9	13	16	19	21	23	25
Materials Handling and Storage	Shop	10	15	19	22	25	28	30
	Office	5	8	10	11	13	14	15
Cleanliness and Orderliness	Shop	14	20	26	30	34	37	40
	Office	21	30	39	45	51	56	60

Figure 2. Plant housekeeping rating values by which each department is judged. Normal ratings for all three factors add up to 85, for which there is no penalty. For each 5 points or fraction thereof below 85, participating supervisors of the department in question are penalized ½ of 1 percent

PLANT HOUSEKEEPING INSPECTION AND RATING SHEET

Dept. Number_____ Inspection Month_____

Dept. Name_____ Inspection Date_____

Section or Group_____ Previous Rate_____

Office_____ Shop_____ Building_____ Plant_____ Auditor_____

	Poor		Fair		Normal		Excellent
Conformance to Layout and Equipment Standards	○	○	○	○	○	○	○

REASONS:

	Poor		Fair		Normal		Excellent
Materials Handling and Storage	○	○	○	○	○	○	○

REASONS:

	Poor		Fair		Normal		Excellent
Cleanliness and Orderliness	○	○	○	○	○	○	○

REASONS:

PLANT HOUSEKEEPING COMMITTEE BY Rate

Figure 3. Rating sheet from which housekeeping factor is determined for incentive computation

PLANT HOUSEKEEPING FACTORS

A. Conformance to Layout and Equipment Standards

1. *Unauthorized Rearrangements* – Unauthorized movements of equipment from location established by approved layouts

2. *Damaged or Obsolete Equipment* – Improperly guarded or unsightly equipment, machines, and fixtures – damaged, unpainted, or defaced

3. *Congested Portable Equipment* – Air guns, drill motors, or office equipment placed so as to hamper operations

4. *Leaks* – Air, gas, water, oil, coolant hazards, leakage from containers, tanks, pipes, or other receptacles

B. Materials Handling Equipment

1. *Protrusions* – Protrusions from racks, bins, benches, file cabinets, or desks which might cause a hazard

2. *Unstable Piles* – Topheavy or unbraced piles, toppling boxes or containers

3. *Cluttered Aisles* – Boxes, waste baskets, storage racks, pieces or piles of materials, tote pans, and skids left in aisles and walkways in such a manner as to create a hazard and retard operations

4. *Overloaded Equipment*–Structures, frames, racks, shelves, totepans, and skids improperly loaded or loaded beyond their capacity

5. *Makeshift Equipment* – Improper use of standard equipment; use of makeshift equipment when standard is available

C. Cleanliness and Orderliness

1. *Dirty Floors and Walls*–Dirt and oil accumulation in aisles, work areas; under benches, machines, racks, desks; misuse of cuspidors

2. *Needlessly Unclean Equipment* – Dirty benches, racks, machines, totepans, etc.; dust, filings, chips, scraps of work, and rubbish allowed to accumulate

3. *Unclean Restrooms* – Restroom and fountain facilities adjacent to the area unclean; lack of use of disinfectants; lack of soap, paper, towels, etc.

4. *Personal Items* – Clothing, lunchboxes, or packages hung or lying on benches, machines, desks, etc., and not in spaces provided or on coat racks

5. *Rubbish and Scrap* – Cigarette butts, papers, bottles, racks on floors, machinery, and benches; in yards or any other location except proper containers; use of other than proper containers for rubbish accumulation.

6. *Projections and Hazards* – Nails, rough jagged corners, broken glass, hanging wires, broken flooring and paving etc.

Figure 4. Description of factors on which plant housekeeping is scored for incentive computation

Second Example:

This month	84.57%
Last month	87.34
Realization loss	2.77%
For maintaining — (realization was more than 2 points below last month)	0.00
For increasing (no gain)	0.00
Total	0.00%

Turning again to Figure 1, it is seen that plant average realization is 45.3, an increase of 0.5 percent over last month's figure. Incentive percentage for this factor is therefore 5 percent plus 0.25 (one-half of 0.5), making a total of 5.25 percent.

3. Housekeeping, the third factor used in computing the cost conversion payment, is a penalty only. A housekeeping committee visits every department each month and grades it according to the scale of values shown in Figure 2. These visits are unannounced and made at the convenience of the committee. A plant housekeeping inspection and rating sheet (Figure 3) is used in grading the departments, and a description of the factors used is shown at the left.

In applying the rating scales, *normal* represents good housekeeping considered satisfactory by divisional and corporation management, rather than the average conditions that currently prevail. A *normal* rating results in a score of 85 which means no penalty.

The departmental incentive is affected by the housekeeping grading in accordance with this schedule:

Rating	*Penalty*
85 and over	None
80 under 85	0.5%
75 under 80	1.0
70 under 75	1.5
65 under 70	2.0
60 under 65	2.5

4. Safety is the fourth factor applied to the cost conversion payment computation. Two yardsticks are used —*frequency* and *severity*. Frequency —to refresh the memory—equals the number of lost-time accidents times 1,000,000, divided by man-hours worked. Severity equals number of days lost, times 1000, divided by man-hours worked.

If either frequency or severity is increased, 1 percent is deducted for each. If either is decreased, 1 percent is added for each. No allowance is made for successive perfect records.

Example:

Frequency	
Last month	6.37
This month	5.74
Decrease	0.63
For decrease	+1%
Severity	
Last month	0.008
This month	0.029
Increase	0.021
For increase	−1%

5. Meeting schedules. This is a penalty factor only. The factor calls for a penalty of ½ of 1 percent for each 1 percent the schedules are missed, unless the division manager and the corporation industrial engineering direc-

COST CONVERSION INCENTIVE PLAN
PERCENTAGE COMPUTATION

	Calculation	Basis	Incentive (%)
1. Departmental Realization			
A. This month		75.21	
B. Last month		77.56	
C. Difference in points	(A − B)	− 2.35	
D. Maintaining last month's percentage within 3 points	(10% of B)		7.76
E. Improving last month's percentage (0.5% for each point)	(½ of C if +)		0.00
2. Plant Average Realization			
F. This month		80.76	
G. Last month		75.40	
H. Difference in points	(F − G)	+ 5.36	
I. Maintaining last month's percentage within 2 points	(5%)		5.00
J. Improving last month's percentage (0.5% for each point)	(½ of H if +)		2.68
3. Housekeeping			
K. This month's rating		79	
L. Penalty only (0.5% for each 5 points or fraction thereof below 85)			− 1.00
4. Safety			
M. Frequency last month		6.37	
N. Frequency this month		5.74	
O. For any decrease, +1%; for any increase, −1%			1.00
P. Severity last month		0.006	
Q. Severity this month		0.029	
R. For any decrease, +1%; for any increase, −1%			− 1.00
5. Meeting Departmental Schedule			
S. Manufacturing schedule for month		50	
T. Number produced during month		45	
U. Percentage below schedule	(S − T)	10.0	
V. Penalty factor (½% for each 1% failure)	(½ of U)		− 5.00
	Total		9.44%

Figure 4. How payments are computed for participants in the supervisors' incentive plan

tor determine that the conditions responsible for the failure were definitely beyond the control of the division.

Calculation of Incentive

In order to determine the total amount of increased compensation to be paid to supervision below the department head level in any department, total all the percentages secured from the several calculations described herewith, deducting any negative values which have accrued, and apply the resulting figure to the nearest 1/10 of 1 percent against base salary.

Compensation for department heads and higher personnel is based on the average percent for all departments on the established standards. The total percentage secured is applied to the supervisor's base salary only.

Figure 4. is a sample computation in which the department's realization was actually 2.35 points below last month's. However, it was maintained within 4 points, so each participant was allowed 10 percent of the previous month's realization ($77.56 \times 0.10 = 7.76$ percent).

Plant average realization, on the other hand, showed an increase of 5.36 points, so each participant was allowed 5 percent for maintaining last month's figure. In addition, he was allowed 0.5 percent for each point of improvement, or 2.68 percent ($5.36 \div 2$).

The housekeeping report for the department showed a rating of 79. The penalty for each 5 points and fraction thereof is 0.5 percent, so a total of 1 percent was deducted.

As for safety, there was a decrease in frequency, so 1 percent was added; and there was increase in severity, so 1 percent was deducted. In other words these two items canceled out.

In meeting the departmental schedule, 5 fewer units were produced, and the percentage below schedule was 10. Therefore the penalty factor (½ percent for each 1 percent failure) was applied, and 5 percent was deducted.

The final calculation in this case, therefore, was $7.76 + 5.00 + 2.68 - 1.00 = 14.44$ percent for participating supervisors. Penalty for failure to meet schedule cut the department head's payment to 9.44 percent.

Materials Control Without Unnecessary Paperwork

A. HOFFMAN, Controller, The Lewyt Corporation, Brooklyn

AN IMPROVED SYSTEM for materials control at The Lewyt Corporation, Brooklyn, N. Y., is given credit by the company's management for a considerable reduction in operating costs, expedited deliveries, and better coordination of all functions of the factory.

Before the improvements in the system were evolved, the problem of materials control at Lewyt was particularly difficult not only because there was need for a continuous coordination of the company's own wide range of departments—engineering, sheet metal, welding, machining, tool and die, electrical assembly, mechanical assembly, finishing, inspection, receiving, and shipping—but also because of the unusually great diversity of products this company makes as a "manufacturer's manufacturer."

The improved system at Lewyt dates back about two years to a decision of top management that if materials control were to make a satisfactory contribution to plant efficiency, with a maximum of simplicity and economy in the system's own operation, it would have to be operated just as accurately and thoroughly as financial bookkeeping.

Not Merely a Check

"We want," said top management, "a materials control system that operates not merely as a check for paying our bills and for annual inventory; we want one that will guide and simplify our day-to-day production—that will tell us what we have, where to find it, how much is coming, and how much is needed, and that will supply such information immediately whenever we need it. We want this system to be easy to operate and easy to understand. We want no unnecessary paperwork, but we must recognize the fact that a minute spent to fill in an essential form may save an hour, or a day, or more, in some other kind of labor, and may save financial losses in other categories far greater than the actual labor involved."

To produce a system to those specifications was quite a large order, and it took some time to put it into operation—because it was not possible just to introduce a ready-made system. First of all it was necessary for the system to be devised.

But it was not surprising that the demand for a better system had been made. In common with most other companies, Lewyt heretofore had experienced many aggravations resulting from loopholes in former materials control. For example, there were times when receiving records showed that an incoming shipment of a certain part had arrived, but—with production scheduled to start—the part could not be found except by a time-consuming, patience-exhausting search through thousands of bins and shelves in the storage department.

Likewise, there was the ever-present worry: "How many parts should we order for the new 'X' product—even though we know how many parts we

Although thousands of bins are needed to store the many items used by The Lewyt Corporation, record tags in each bin show the exact status of contents. The same status is just as accurately listed in the file of master records in the main control room

JOB No. 906 / 6442

SHEET 1 OF 5

MATERIAL CONTROL SHEET

Customer Donn Corp.

Cust. P. O. No. 11218

Quantity 1181

Date 7-15-44

Prepared by | Checked by

Description of Item Auxiliary Power Distributing Box

Blue Print No. LT-22933 Used on A-131738 Required Delivery

ITEM	PART No.	ISSUE	B. P. AT.	SPECIFICATIONS	UNIT. QUAN.	QUANTITY Required	Suggested	Ordered
1	33945-1			Cover Assemblies	1	1181	1190	
2	33921-1			Frame Assemblies	1	1181	1190	
3	AN-3102-22-10S			Receptacle	1	1181	1200	1200
4	31560-5			Channels	2	2362	2400	

A master record for each order is kept by the materials control office, listing all component materials or parts. Description of materials and quantities, with allowance for spoilage, are suggested by the engineering department, which also may recommend a vendor if an item is not to be home-produced. Other columns provide spaces for listing prices, expected delivery dates, and additional details

have in inventory?" This worry was predicated on the fact that there always existed a chance that someone might be counting on using some of those stored parts for some other job, or the possibility that some actual delivery of incoming material had been less than the quantity shown in the purchasing records—with the discrepancy not immediately accounted for.

So it was that a reorganized controlling department dug into the problem and finally came up the control system that has operated since without a hitch. This whole system centers around a set of master records that tell a complete story of the status of all materials and that reflect any changes the day they occur. These records of materials not only serve as a wholly reliable guide for the replacement of materials and payment of bills, they are also equally reliable as an essential guide to a related system of production controls, and to the cost-accounting department, and they even provide the key of "where to find it" for every material ordered into or out of the stockroom.

With such a bill of particulars it might appear that such a comprehensive record would require the services of a large bookkeeping department. Instead, its very comprehensiveness is what makes it simple to operate. No time need be expended in hunting for facts; all the facts needed are automatically assembled. Consequently, in the electronic division where several hundred people are employed, for example, the services of only one person—a woman— are needed to operate the master record.

Here's how the system works:

1. The materials control sheet (master) is a printed form with spaces for name of customer, job number, and similar general details, and for the recorded status of each component part classification used in the production of a customer's order. Spaces for details concerning each item are arranged in columns as follows: Item number, part number, blueprint attached, blueprint issue designation, name of item, quantity required for each unit of finished assembly, total quantity of item to be used, suggested quantity to be ordered or manufactured including allowance for spoilage, amount actually ordered, source of material, date of order, purchase order number, price, final cost, expected delivery date, quantity of assembled product to be manufactured by lots (a column for each lot up to 10), material ticket number and date of incoming shipments or in-plant completion of parts, quantity of each shipment received, and cumulative totals.

2. The engineering department pencils in the list of items, part numbers, blueprint code, quantities required, and may suggest (or repeat customer's specifications) the name of vendor from whom the material should be obtained, also the price, if that information is available to the engineering department. Likewise, the same department may suggest items for Lewyt to manufacture.

3. Engineering department and production control department decide whether order should be produced in one or more lots, and the size of the lots. This information is furnished also to the materials control office.

4. A typist copies the information up to this point on a stencil to fit the form of the master control sheet, and then reproduces it by stencil on one of these sheets for the materials control office.

5. The same stencil then is used to transfer basic information to a set of white, yellow, and pink cards. Each card is limited to a single item, although 12 items appear on each page of the master control sheet. (Eleven items are blocked out on the stencil momentarily for the process of reproducing the twelfth item.)

The white card, "Material Requisition," goes first to the inventory con-

DELIVERY INFORMATION		REMARKS

	VENDOR	Date of Order	P. O. No.	Price	Extension for Costs		Expected Delivery Date		
Suggested Supplier	Mech. Dept.								
Bought From									
Suggested Supplier	Mech. Dept.								
Bought From									
Suggested Supplier	American Phenolic Co.	5/5/44	39473	.60 ea.	720	00	25% 5/28	50% 6/28	25% 7/28
Bought From									
Suggested Supplier	Mech. Dept.								
Bought From									

trol department. If it is found that any of the material is in stock, a pink material ticket in quadruplicate is made out by hand, one copy of which is sent to the stockroom so that the number of parts it calls for will be reserved for this specific job. This ticket is actually attached to the stock.

Meantime, the inventory control department lists the quantity stock on the white materials requisition card and sends the card on to purchasing.

If the card shows none of the part is in stock, or not enough, the purchasing department issues a purchase order for the quantity needed.

6. Eight copies in different colors are made of the purchase order. No. 1 is for the files of the vendor or supplier. No. 2 is for the vendor or supplier to acknowledge and return. No. 3 goes to the receiving department. No. 4 goes to materials control. No. 5 goes to the inspection department. No. 6 is for the purchasing department's files. No. 7 is a follow-up copy, also retained by purchasing.

7. When shipments of parts are received, the accompanying packing slip bearing the purchase number is checked by the receiving department with the No. 3 copy of the purchase order, and the amount received is entered on the purchase order copy. At the same time a set of five tickets is made out, recording the receipt of the material, one being sent to the purchasing department to enter on the follow-up copy of the purchase order. The same ticket is then sent on by purchasing to the accounting department to be attached to the supplier's bill.

Second copy of the ticket of incoming material is sent to inventory control, where its information is copied onto one of the card forms which comprise the continuous inventory record files. In these files there is an individual card for each part so that, although one kind of part may be used on a dozen different products for as many different customers, all of these parts are inventoried on a single card. This card shows the total on hand, ordered, received, and assigned. These are the cards to which the inventory control department refers when—as in step No. 5—it receives the original materials requisition card.

These inventory cards also provide vital information. For example, if there is a delay in the receipt of a part essential to production of some product, and a supply of the same item has been allotted to another product but cannot go into production for some reason, the parts on hand can be diverted to the job where they can be used first, without confusing the records.

Third copy of the ticket of incoming materials goes to materials control to be entered on the master record. These cumulative entries on the master record permit the materials control department to know at all times whether there is a shortage of any item essential to production of an order. One column beside each item shows any allotment of parts from stock and the amounts received by purchase orders. If the cumulative total in this column shows the requirements are only partly complete, a "P" is marked beside the name of item on left hand margin. When the amount finally is adequate, the "P" is erased, and a check mark used in its stead.

Inspection of this margin, therefore, provides a visual control of the materials for each order. Inspection of the other column, showing cumulative totals for each item, also could constitute the basis for a more detailed visual control, and Lewyt is considering the possibility of expressing these totals beside the requirements for each job in terms of red and black lines to complete the visualization. (In such case, the colored lines would substitute for the "P" marks and column checks.)

Fourth copy of the materials ticket is for bin location. On it the receiving department marks the place where the material can be subsequently found. It keeps this ticket in its files, where it can be identified quickly by number when the department receives a materials release form calling for the material to be delivered.

Fifth copy of the materials ticket is on heavy paper. It is attached directly to the material received, and is left with it after it is placed in storage.

8. When production control's schedules reach the date assigned as a check-up deadline for materials needed on a forthcoming job, another survey is made of the material records on the master materials control list. At this

JOB No. 906 SHEET 1

ITEM	PART No.	DATE	M. T. No.	QUAN.	TOTAL	DATE	M. T. No.	QUAN.	TOTAL
1	3.3945-1	7/31	22571	51	51	8/5	22597	100	275
		7/31	91136	24	75	8/7	22598	65	340
		8/1	22577	100	175	8/8	22607	127	467
2	3392I-1	7/31	22571	51	51	8/5			
		7/30	91135						

DESCRIPTION: WASHER - Mica | SIZE OR TYPE: 1" O.D. x 3/16" I.D. x 1/32" th | PART No.: 40364-C

UNIT | LOCATION | AVERAGE PRICE | MAXIMUM | MINIMUM | CARD No.

ASSIGNED			ORDERED				Unassgnd. Balance	RECEIVED					ISSUED			Balance in Stock
Job No.	M.T.No.	Quan.	Date	P.O. No.	Quan.	Price		Date	P.O. No.	M.T. No.	Quan.	Bal. P.O.	Date	Job No.	Quan.	
204		3000	6/14	20115	3000	4.35M		6/20	2115	11383	1000	2000	7/1	11383 204	1000	2000
							180	6/25	2115	12100	2000	—	7/10	12100 204	1000	1000
483	I.T.4142 20291	520	7/15	IT432	1000			7/15	IT432		1000	—	7/20	12100 204	1000	1000
549	I.T.4142 21117	300														

On a separate sheet, bearing identifying job number, the control office also keeps record of material received, with cumulative totals. The inventory record (foreground) uses a separate card for each item, shows amounts allotted to each order, and quantities remaining for further allotments

time, if shortages are shown in any items, they are listed on a materials shortage list which is sent to purchasing as a reminder to start expediting.

9. The yellow card previously mentioned in section 5 is the materials release form. If the entire order is to be produced as a single lot, only one yellow card is run off for each item on the list, and the "lot" quantity written in on the card is the same as the total quantity. If the order is to be produced in a series of lots, then the operator of the duplicating machine runs off as many yellow (and red) cards as the number of lots.

The yellow cards are held at the materials control office until the production department signifies it is ready for the materials to be taken from storage and sent to one or more of the production sections. Then the yellow cards are sent to the receiving-storage department. This authorizes receiving-storage to deliver the materials to production, and lists on each card the material ticket numbers and quantities they represent (which materials control previously copies from the material tickets turned in by receiving at the time the materials were received). This permits receiving-storage to locate in its own files the corresponding copies of material tickets telling the specific location of the materials.

The same process of sending through yellow tickets is used with each of any later lots scheduled for production.

10. The red cards are for material identification and contain information duplicating the yellow. They are sent with the yellow cards to the receiving-storage department. The red cards, however, under a space for "remarks" give instructions where the material is to be delivered to the production department. Finally, the red cards are attached to the materials they call for, and remain with these materials after they have been delivered to the production rooms. This makes it easier for identification by production employees when the parts are redistributed for further machine processing or to the assembly lines.

THE AMERICAN WAY

This war can be won and it can be paid for only if we produce. There must be such a burst of production, such a fever of energy, such a wealth of invention, such an outpouring of skill as the world has never seen before. All these resources are right at our finger tips through the magic of chemistry and engineering and technology, and the American people should speak with one voice: "Clear the road for production!" Whether the obstruction is business practice or union requirements or government red tape, all must make way for victory in war and recovery in peace.

Henry M. Wriston in "Challenge to Freedom"

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Every Part in Bomber Listed for Reference

A book that lists every part, past or present, in a B-24 bomber, is officially known as the "Master Numerical Parts and Reference List" at the Willow Run plant of the Ford Motor Company, Dearborn, Mich. An outgrowth of automobile days, it is a comprehensive volume, giving fundamental information on every part that goes into the ship. By this book one can identify any piece of material or part, and determine both its source and its route.

Pages that go in the book are made up in panels which are photographed and printed. Book is 6 inches thick, 16 inches in length, and 13 inches wide. It contains 1755 pages and lists 35,000 part numbers.

Girl at Ford Willow Run plant makes up panel which will be photographed, printed, and placed as a page in the "Master Numerical Parts and Reference List." Book contains 1755 pages and lists 35,000 part numbers—every part, past or present, in the B-24 bomber

•

Germ-Killing Lamps Cut Absenteeism

As a further step in making the workrooms and offices of Moyer Manufacturing Company, Youngstown, Ohio, pleasant and healthy, ultra-violet germ-killing lamps have been installed. These lamps combat airborne infection and are the equivalent of approximately 100 complete changes of air per hour. Similar installations of lamps in hospitals have proved them effective in cutting down colds and flu. They prove effective in reducing absenteeism.

Germ-killing lamp on wall of Moyer Manufacturing Company serves to combat colds and flu, and thereby reduces absenteeism

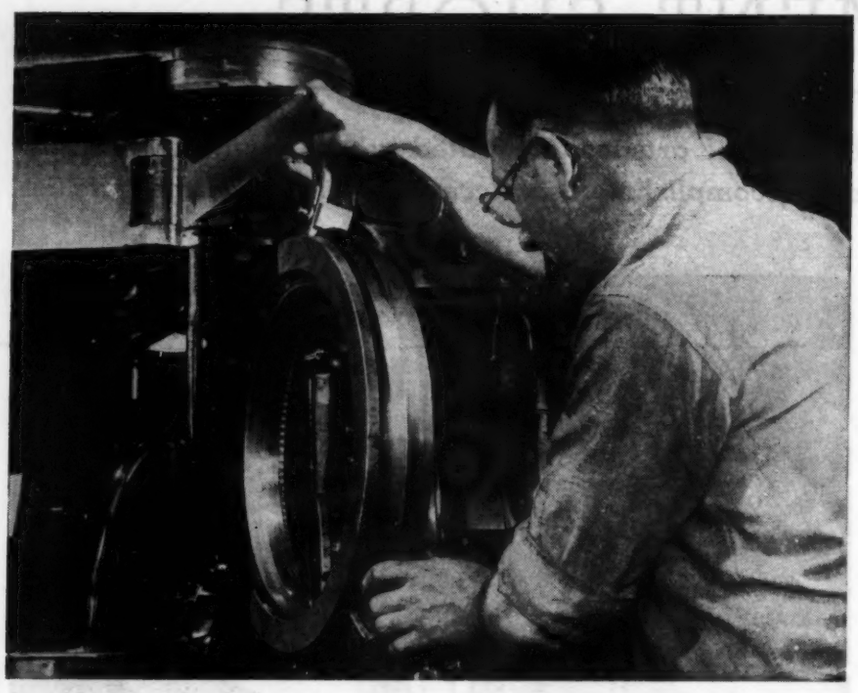
•

Contributions "Club" Saves Workers' Time

Sponsored by Employees' Recreation Club and the union, a means of saving time and trouble in making contributions to worthy charities has been evolved through the organization of the "Buck-of-the-Month Club" at Lockheed Aircraft Corporation, Burbank, Calif.

An attractively printed booklet acquaints all employees with the plan. Through a series of questions and answers the entire story of the functions of the club is brought to the attention of all workers. The purposes of the club are two: (1) To provide, at slight individual cost, opportunity for all employees to participate in worthy charities and aid-deserving welfare organizations; (2) to save vital time by eliminating all other fund-raising campaigns among Lockheed men and women for the duration of the war.

To join the club an application card is



Easy handling and greater maneuverability for 21-in. bevel gears are provided at Allis-Chalmers Manufacturing Company, Milwaukee, by a circular clamp hitch designed to fit the circumference of the gear. Gears must be mounted and unmounted several times for rough and finish machining, testing, and lapping, without damaging the gear teeth. The special fixture holds the gear firmly in three places, with the clamp for hitching to the hoist being adjustable

←

signed and dropped in a time-card box. The payroll department is thereby authorized to deduct $1 a month from the individual's salary. Through these small deductions the Buck-of-the-Month Club was able in the first 28 months of its existence to contribute a total of $983,304 to welfare and relief organizations.

A committee, consisting of the president and vice-president of the Lockheed Employees' Recreation Club and the president and vice-president of the union, serves as the agent for club members. Company executives act as advisory members. The committee investigates and votes on all requests for contributions. Before a donation is approved, the vote of the committee members must be unanimous. When a request is agreed upon, the committee decides upon the amount to be given, taking into consideration the extent of the need and the funds available.

Each club member receives a card that certifies that he or she is a regular contributor to the Buck-of-the-Month Club, and a duplicate card is issued for use at home to enable members to avoid making double contributions.

The only overhead expense paid out of the Buck-of-the-Month Club funds is for checkbooks, the bonding of disbursing officers, and the cost of the regular audit. The officers serve without pay. Lockheed, as part of its contribution, pays all other overhead and the cost of the booklet was paid by Lockheed as part of its contribution to the club's activities.

→

One of the ways in which the Illinois Central keeps in the minds of all workers the importance of their ideas is through placing in conspicuous places—on bulletin boards and the like—posters such as the one reproduced at the right. The original is on pink newsprint—economical to produce and practically impossible for the workers to miss

IDEAS!

We all have ideas—good ideas—but no matter how good an idea is, it is useless unless something is done about it.

Illinois Central employes have received more than $210,000 for doing something about their ideas!

They did it by making 125,133 suggestions on the numbered blanks provided for that purpose by the Employes' War Production Drive Suggestion System.

Consideration of these suggestions by joint labor-management committees proved more than 19,000 of them to be usable, and their adoption made it possible to do a better job of moving war freight and essential civilian traffic.

The year 1945 presents new opportunities to make suggestions that will eliminate waste, lengthen the life of equipment, improve safety, speed train operation, and otherwise make it possible to do a better job of transportation.

Because your ideas are valuable to winning the war, your labor-management committees have set a suggestion goal of 45,000 in '45. Do your part by submitting a progress-making suggestion NOW!

45,000 IN '45

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

CONTENTS OF THIS SECTION

Editorials 116

Preventive Maintenance With Two Forms — *H. H. Wermine and William Ratzer* 117

Control Heat, Save Fuel — *Ames Penfield* 121

Overhead Platform Gives Low-Cost Work Space — *Philip G. Swanson* 124

What to Do Before Reapplying Motors — *W. T. Brooks* 126

Conditions Inventory of Plant Service Equipment—7. Materials Handling Equipment, Part III 130

Maintenance Shorts 136

What's New in Equipment 140

Catalog Service B-96

MAINTENANCE CONTENTS OF THE TWO PRECEDING ISSUES

FEBRUARY

Trouble-Free Lubrication for 4000 Machine Tools — *Kenneth Hillgartner* 135

No More Oil Mist in the Air — *John W. Smith* 138

Lower Yard-Labor Costs by Planning Every Move — *Edward L. Cook* 140

Color in the Plant — *Faber Birren* 143

An eight-page editorial feature

How to Get the Most From Commutators and Sliprings — *J. V. Dobson* 151

Conditions Inventory of Plant Service Equipment—5. Materials Handling Equipment (Part I) 155

Health and Safety Equipment 158

Maintenance Shorts 164

Data Sheet: Use of Weir Gage to Measure Pump Capacity .. 168

What's New in Equipment 170

Catalog Service 302

MARCH

Scheduling Every Function of Preventive Maintenance — *Elmer A. Munson* 137

Keeping a Fleet of Electric Trucks in Service — *L. M. Blakely* 141

Saved Fuel by Covering Forgotten Steam Pipes — *E. J. Rasmussen* 146

Transformer Inspection Avoids Overload Troubles — *John M. Webb* 148

Tight Scheduling Prevents Hit-or-Miss Lubrication — *N. Lee Hastings* 151

Servicing Fluorescent Lighting Equipment — *H. J. Kreutzinger* 155

Conditions Inventory of Plant Service Equipment—6. Materials Handling Equipment (Part II) 158

Portable Tools 162

Maintenance Shorts 164

Data Sheets: Conversion Factors for Engineering Quantities. 168

What's New in Equipment 172

Catalog Service 290

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York 18, N. Y.

Director of Circulation:
Change my address on Factory Management and Maintenance

Name .....

Old Address .....

New Address .....

New Company Connection .....

New Title or Position .....

FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42nd STREET, NEW YORK 18, N. Y.

MAINTENANCE as the Editors See It

New Truck Tires Will Be Harder to Get

TAKE GOOD CARE of truck tires. That better-be-heeded warning is starkly clear in the recent announcement that a 50 percent cut has been made in the number of heavy-duty tires allotted for essential commercial motor vehicles during the second quarter of this year. This action has been made necessary by a serious shortage of carbon black and other materials.

Many industrial plants depend heavily on trucks for the transportation of both raw materials and finished product. Enforced idleness of this equipment, due to worn-out tires, would be serious.

Tires can be abused, and their life thereby shortened, in a number of different ways. For example, excessive speed causes rapid wear of the tires; saving a little time at the expense of hard-to-get tires is not a profitable exchange.

Proper inflation is a prime essential to long tire life. Both under- and overinflation result in less than normal life.

Overloading is a common form of abuse that leads to destruction of the casings.

Heavy impacts, such as result from striking curbs, obstructions, or the sides of holes, result in broken or weakened cords; then a blowout.

Using new and worn tires together on dual wheels is a common form of abuse that soon takes the life out of the new one.

Plant operating executives will do well to make sure that vehicle drivers understand and follow conscientiously the simple principles of tire conservation.

How Often Do You Have a Lubrication Survey Made?

A COMPLETE LUBRICATION SURVEY every two years has been found by one large plant to be the answer to the problem of reducing bearing troubles.

A number of years ago recommendations based on a rather superficial study of the lubrication requirements gave good results. War orders came early to this plant. Higher speeds for some machines, more hours of operation a day for all, brought more bearing trouble. Another survey of lubrication methods resulted in more helpful recommendations.

Why wait for trouble before getting up to date on lubrication? The executive in charge of maintenance asked himself that question, and the answer was perfectly obvious. Thus was developed the practice of making a survey every two years.

Whether a period of two years between surveys is too long or too short may well be a matter of opinion, influenced by conditions in the plant. But there is little room to quarrel about the basic soundness of the idea.

There are facts and factors about lubrication that are still unknown, but we know much more about the subject than we used to. Better lubricants are being produced. Lubricating devices, too, have been greatly improved.

It is to be expected that improvements in lubricants and devices for applying them will continue to be made for a long time to come. Any plant that fails to take prompt advantage of them, or of any other new materials and equipment, is voluntarily putting itself under a handicap that will inevitably make operation less profitable.

Make Sure That Painting Is Properly Done

PAINT-UP PROGRAMS will soon be under way in a good many industrial plants. That is as it should be. If the work is properly done, the cost will be insignificant in comparison with the benefits. Among others, these benefits include protection against deterioration, and improved appearance.

It is a virtual certainty that some of this painting will be done by men who have not been trained for the work. It is true that anyone who is not physically disabled can paint, but it does not follow that the work will be properly done. The chances probably are against it.

For one thing an inexperienced man is likely not to realize the importance of proper preparation of the surface. New formulas and new materials have been combined to produce paints that are of superior quality and better able than some former products to give good results when the surface to be covered is not in ideal condition. However, unless a paint is recommended by the maker for application on rusty, damp, or oily surfaces, it is much safer to correct such conditions before painting.

Selection of suitable paint is another matter that ought not to be left to the inexperienced, particularly when unusual conditions prevail. A paint that is ideal for some conditions may fail to give satisfactory service under others.

If it is not possible to have painting done by experienced, capable workmen, it will pay well to have the work closely supervised by someone who knows exactly what ought to be done, and how to do it.

Preventive Maintenance With Two Forms

H. H. WERMINE, Chief Engineer, and WILLIAM RATZER, Plant Engineer, Belden Manufacturing Company, Chicago

A PREVENTIVE maintenance program which is based on regularly scheduled inspections of all production machinery and auxiliary production equipment in the Richmond, Ind., and Chicago plants of the Belden Manufacturing Company is the biggest single factor in keeping production at high levels with lowered maintenance costs. These desirable achievements are made possible because the program does these two things:

1. It discovers the need for minor repairs before they grow into major repairs and thereby avoids the penalty of needless downtime of machinery.

2. It reveals continual machine weaknesses and repeated causes for repair, which leads either to redesign of machines for more economical maintenance, or to their removal from service when maintenance costs are found excessive.

The program that is in operation today is the result of gradual development of a preventive maintenance system that was organized in both plants about 12 years ago to combat the progressive effects of wear and tear on many of the machines used in the manufacture of insulated wire and cable. Most of the production machinery, particularly that used in wire-drawing operations, and also in mixing and sheet-rolling of rubber insulation, receives severe punishment even in the normal course of operations.

To render reliable reports, inspectors who make preventive maintenance inspections must be thoroughly familiar with the operation and repair of machinery they inspect

Many Machines to Check

In the Chicago plant there are some five hundred machine units, involving more than twenty different types of production machines. This number does not include the usual assortment of auxiliary machinery, such as air compressors, blowers, ventilating equipment and maintenance-shop equipment. The Richmond plant contains twice as many production units, also involving about twenty different types of machines, plus a similar amount of auxiliary equipment.

Obviously, the efficient inspection of every one of these machines requires a plan that not only will direct the frequency of inspection, but also will insure as far as humanly possible that each inspection has been thoroughly made. For these purposes two special forms have been designed, (1) a check list for every type of machine to guide the inspector in his work; and (2) an inspection report to record his findings as a preface to preventive maintenance work.

Before proceeding with a description of the two basic forms, however, a review of general requirements involved in their use will be helpful to a better understanding of their application. The qualifications of the inspector, for instance, are important. When the system was instituted 12 years ago, it was realized that only men who were thoroughly familiar with the operation and repair of the machinery they were to inspect could render reliable reports. On the other hand, the wisdom of another rule also was recognized—that men engaged in the repair of machines are not to inspect these machines. In other words, men never inspect their own work.

In the Chicago plant, a mature and fully experienced maintenance man was assigned to preventive maintenance inspections. He is still on the

MACHINE INSPECTION

To be made on 1st of each month. Inspect and check off following items. Enter all defective items in red pencil

	Def.	OK	Def.	OK	Def.	OK	Def.	OK	Def.	OK
Motor		✓		✓		✓		✓		✓
Bearings	✓			✓		✓		✓	✓	
Gears	✓		✓		✓		✓		✓	
Clutch		✓		✓		✓	✓			✓
Brake		✓	✓			✓		✓		✓
Piping		✓		✓		✓		✓		✓
Guards		✓		✓	✓			✓		✓
Lubrication	✓		✓		✓			✓		✓
Rolls		✓		✓		✓		✓		✓
Cutter		✓		✓		✓		✓		✓
Inspected by	H.V.		H.V.		H.V.		H.V.		H.V.	
Date 1944	6-1		7-1		8-1		9-1		10-2	

Figure 1. Check list is given inspector for each machine to assure inspection of every needed part. Items in "defective" columns are checked in red so that repetitive trends can be easily distinguished

job, and spends about one-half his time currently on machine inspection. In the Richmond plant there are five maintenance men, chosen for their special knowledge of the various types of machines, who are regularly engaged for about one-quarter of their time in machine inspection. In addition to these regular inspectors, maintenance helpers are assigned, whenever necessary, to facilitate the inspection of large equipment, such as heavy wire-drawing machinery and rubber-mixing machinery, by assisting in the removal of guards, gearbox covers, and similar items. Nothing is allowed to hinder a thorough inspection.

How Often to Inspect?

Decision as to the frequency of inspection also is important, because a higher frequency than needed would involve needless cost, while too low a frequency would defeat the purpose of the program. Obviously, the frequency is governed largely by the type and design of machine and its hours of daily service.

Most machines in these two plants are inspected every 3 months, which has been found by experience to be an average requirement. Some machinery, however, that is well-designed as to type of bearings and lubrication of moving parts, requires inspection only once every 6 or 12 months. On the other hand, other machinery, because it lacks these features of design, requires a monthly or even a semi-monthly inspection. There have been variations in the established schedules, it is true, in part because of inability to shut down machines working on a 24-hour, 7-day week war schedule, and because of manpower shortages. Such variations have served only to emphasize, however, the desirability of close adherence to schedules.

But no matter how competent the inspector, or how frequent the inspection, the assurance that all parts are being inspected that should be inspected rests ultimately with the check list (Figure 1), which itemizes all parts of a machine requiring inspection. A check list has been set up for every machine in each plant except one or two large groups of slow-speed braiding machines, which are grouped together. Each list is identified by the name and inventory number of the machine. In the Richmond plant, for example, there are 395 check lists, including 2 lists on which it has been found feasible to group 300 and 340 individual braiding machines of the same types. The lists otherwise represent, however, only about 20 types of machines, so that the job of setting up individual sheets was not as difficult as it would first appear.

Much thought and care were exercised in the choice of the items listed for inspection on these check lists. The items selected are the result of collaborative efforts of the plant engineer, the departmental foreman, and the departmental production engineer, representing the respective viewpoints of maintenance, operating, and planning forces. Each type of machine had to be carefully analyzed to determine all wearing parts. No part essential to uninterrupted operation could be omitted, yet neither could the check list be broken down into needless refinements that would make the inspection burdensome. After all, a working knowledge by the inspector of the operating functions of various subassemblies had to be presumed. Items such as motor, clutch, bearings, and gears are a fairly common introduction on all check lists. Then follow the special items peculiar to each machine. When experience has demonstrated the need for specifying inspection of individual parts, they, too, have been added to the list.

The inspection of motors, it should be stated, is limited to a search for physical defects only, and does not include instrument tests for electrical characteristics. Such tests are regularly made by the electrical maintenance department. The check-list inspection does include a feeler-gage check for equal clearance between stator and rotor *all around* the circumference, which is considered the best method to discover any eccentricity of the shaft. This test alone has avoided several bad breakdowns.

Check Lists Are Filed

All check lists in both plants are kept in a file in the office of the machine-shop foreman, who is responsible for adherence to the inspection schedules. In this file the check lists are arranged in departmental folders, according to the department number placed in the upper left-hand corner of each sheet. Each departmental folder, in turn, is subdivided according to the frequency of inspection, which is stated at the head of each sheet. When the due date for inspection arrives, the inspector is given a folder containing the group of check lists on which he is to work.

As the inspector proceeds with his inspection of a machine, guided by the itemized check list, he enters a check-mark in one of the two columns prescribed for each inspection date, to show whether the item has been found "O.K." or "Defective." All "O.K."

marks are made in black, but "Defective" marks are made in red. This color distinction has facilitated the interpretation of check lists for better maintenance, as will be considered later. Upon completion of an inspection, the date and the inspector's initials are noted at the bottom of the column.

This system of inspection has definitely disclosed conditions that would have been otherwise undiscovered and would have eventually caused severe damage. On a large rubber mill, for example, the inspector found that one of the bolts that clamps two halves of a split pinion was broken. Had this pinion, which transmits 100 horsepower, come apart, the result would have been serious. In another case, the oil line supplying lubrication to a water pump was found clogged. Such a condition, if unchecked, always results in a major repair, and in this case it happened to be the pump that furnishes process water to the entire plant.

Previous Procedure

In the method of the use and disposition of the results of each inspection lies largely the secret of the efficiency of the preventive maintenance plan. Until recently, the details of all defects found, no matter how small, were entered on the check list, and, because of the greater space required for such data, each sheet had to be removed after every three inspections. Formerly, too, each completed check list was promptly reviewed by the machine shop foreman, who is in charge of all maintenance forces, to determine the nature of repairs and to instigate the necessary orders for every defective item. Small jobs, such as tightening bolts or making minor adjustments were orally assigned by him to the repair mechanic normally stationed in every department. For larger jobs, but under $25 in estimated cost, the foreman made out a "white repair order," on which the signature of the departmental foreman had to be obtained to keep him posted as to what was going on. On jobs in excess of $25, a yellow "EX" order was issued, requiring executive signatures.

Now, however, the inspector takes certain short cuts that have simplified the procedure of ordering repairs. Small jobs are discussed directly by the inspector with the departmental mechanic, who also is given a written list, on plain paper, of the items requiring his attention. For the larger jobs requiring a "white repair order," the inspector now carries order blanks with him, which are filled in and given to the departmental foreman for usual signature and routing. For projected repairs over $25, requiring yellow "EX" orders, the inspector has been provided with a new simple form, called the "Summary of Inspection Report" (Figure 2), on which he enters in the top half the details of the defects he finds, also his suggestions for remedy. One report is made out for each department, and shows at a glance at any time what outstanding repairs are required in that department. This report is given to the machine-shop foreman, who needs now only to occupy himself with the more important repairs. When the inspector has accounted for all the red-checked items of a completed check list by one of these three available methods for obtaining repair, he returns the check list to a clerk in the machine-shop office, where it is filed to be ready for the next inspection.

At the bottom half of the "Summary of Inspection Report" is a space captioned "Disposition." In this space the machine-shop foreman enters the decision made for repair of each item of defect noted by the inspector in the top half of the same report. This decision is usually the result of conference with the departmental foreman, production department, and engineers, who collectively weigh all factors involved in the repair. In normal times a prompt date of repair would be decided upon. Now, however, it is sometimes necessary to postpone a repair, because of war work, to a tentative date beyond which operation would be inadvisable. The date of availability of spare parts is sometimes also a determining factor. Whatever the decision may be, it is entered by the foreman on the summary report, and "EX" orders are issued accordingly. These orders, incidentally, are followed up semimonthly by the machine shop foreman for completion.

Foreman Sees Reports

Summary reports are first cleared by the inspector through the machine-shop foreman, rather than through departmental heads, for one important reason. By this course the executive heads are able to arrive at a better decision on disposition, because the foreman has been able to make a prior analysis of the nature and seriousness of the needed repair.

Thus has been laid the groundwork for a high order of preventive maintenance. The plan provides for scheduled inspections and certifies their thoroughness by check lists. It provides a simple routine for translation of the results, by the use of the sum-

Only a thorough inspection, requiring removal of guards, gearbox covers, and the like, made possible the discovery of a broken bolt of a split pinion on a 100-hp. rubber mill

SUMMARY OF INSPECTION REPORT

Date 10-2-44 Dept. 33

Recommendations and Critical Items Needing Urgent Attention

1. 84" Rubber Mill—Main drive gears badly worn—suggest reversing
2. #3A Banbury Mixer—Main bearings do not get enough lubrication. Suggest automatic force feed
3. Crane—Bridge wheels and bearings should be replaced

DISPOSITION

1. Machine cannot be released from production at this time. Postponed until 12-5. J.H. 10-3-44
2. Yellow order entered to purchase and install automatic lubrication system on 3A Banbury. J.H. 10-3-44
3. Replacement parts are on hand. Will be installed on Sunday, Oct. 8. Order has been entered. J.H. 10-5-44

Figure 2. Defects requiring major repairs are entered by inspector at top of summary report for each department. Machine-shop foreman promptly plans for repair and enters disposition below

mary report, into prompt action for repair. To stop at this point, however, would be a failure to reap the full benefits of these efforts. One of the major contributions from the results of the preventive maintenance inspections is being obtained at a quarterly meeting of a committee of plant executives, consisting of the plant superintendent, plant engineer, production or process-method engineer, maintenance inspector, departmental foreman, and machine-shop foreman. At this meeting the check lists and summary reports are reviewed, analyzed, and discussed, to determine trends, to formulate long-range policies in the maintenance and replacement of all types of equipment, and to solve maintenance problems. Progress of maintenance work also is reviewed, and agreement as to the nature of needed improvements is obtained among a representation of all departmental interests.

The review of check lists is particularly important for the revelation it affords of costly repetition of the same defects in any machine. This information is easily obtained by thumbing through the check lists and noting wherever a series or intermittent reappearance of red marks occurs in any one horizontal line. A repetition of this kind clearly demonstrates the need for better design of a continually failing part, or for a change in method of machine operation. In several cases it has indicated lack of proper lubrication, leading to the installation of an automatic lubrication system for solution. Frequently the maintenance costs of a continual offender are studied and found to justify replacement of the machine.

Prior to the development of a check list that shows the results of 24 successive inspections on one page, instead of 3 as formerly, the advantages to be gained from this extensive history were largely lost. Red-check incidents went on unobserved for years, and the company was spending money in continual repair because of failure to recognize the situation.

The summary report functions with similar efficiency to enable quick determination of the major repair problems at hand. Before its adoption, the meeting was faced with the proposition of reviewing every minor as well as major item on all check lists to determine the ones most deserving of consideration. Because minor and inconsequential repairs do not appear on the summary sheets, the elimination of this tedious analysis has released a large percentage of the committee's time for the more important and valuable achievements.

Occasionally a summary sheet bears a "disposition" by the machine-shop foreman that reads, "Hold for discussion at next meeting." This occurs whenever the foreman or any of his original conferees are in doubt as to the nature or advisability of repair, and when it also can wait for more thorough discussion at the meeting.

Several indirect benefits add to the value of the preventive maintenance plan. For instance, a material reduction in the total number of "white repair orders" has been noted. This means that the department mechanic, who is responsible for conditions in his department, is alert to the challenge of scheduled inspection, and is correcting many of the small defects before they reach the "white repair order" stage.

Flow of Suggestions

Another excellent byproduct has been the flow from inspectors of valuable suggestions for improved machine or process design, which have reduced the cost of maintenance or repair. Because these suggestions are the result of training and accumulated knowledge developed by constantly looking for and anticipating trouble, they are proving highly worth while.

The preventive maintenance program has also counteracted the effects of an unfortunate but understandable tendency of operating employees to refrain from advising their supervisors of any incipient machine trouble, hoping thereby to complete their shift without machine shutdown. In such instance, considerably more damage can result by running the machine to the breaking point. Preventive inspections have largely removed this temptation by not allowing machinery to reach this critical condition.

It is difficult to evaluate the full benefit of this preventive maintenance program by statistics, because there is no possible means of measuring what has not happened. While it cannot be said there have been no machine breakdowns during its tenure, whatever breakdowns have occurred have been due to hidden defects beyond ability to discover. There is no question, however, that the program is responsible for higher production at lower maintenance cost than possible without it. And, because it keeps production machinery in better condition, the program also helps to maintain a high standard of quality in the finished product.

Zone thermostats on interior columns control electrically operated valves on window radiators in office

Control Heat, Save Fuel

AMES PENFIELD, Warehouse Manager, James B. Clow & Sons, Chicago

BETTER REGULATION of heat in the Talman plant of James B. Clow & Sons, Chicago, is justifying the cost of automatic thermostatic control equipment needed to attain it, by these significant results:

1. Substantial saving of fuel.
2. Improved cold-weather comfort for office and shop workers.

From these benefits flow other advantages in sustaining good employee relations and high productivity, not to mention miscellaneous economies effected by more efficient operation of the various heating systems involved.

Action for obtaining better heat regulation was prompted originally by the fuel conservation program launched by government agencies in 1944 to reduce the needs for coal. The factor of comfort for the office workers also influenced the decision to obtain better heat regulation in one department.

The possibilities for fuel conservation by heat regulation at the Talman plant appeared to be particularly feasible in three places—the office, the two sprinkler water tanks, and the pipe-threading shop. The problem of heating the office satisfactorily was a difficult one, because of conditions typical of many establishments that combine office and factory space in one building or a group of buildings. In this instance, the entire second floor in a warehouse-type building, with an area 125 by 200 feet, is devoted to office work. A few private offices are partitioned off, as are also the men's and women's locker rooms, but for purposes of considering the heating problem an open area in excess of 20,000 square feet with 11-ft. ceiling height is involved. This area has about 80 percent of its glass exposure equally divided between east and west, and is heated by a one-pipe gravity steam system with standing cast-iron radiation placed around the outer wall under the windows. The relatively small exposure to the north and south is because of adjacent buildings.

Originally designed for an oil-burning steam supply, no provision had been made in the original installation for any control of heat except by manual modulation, starting, and stopping of the burners in the two 75-hp. low-pressure fire-tube boilers. Because the fuel admininstration had previously requested conversion to solid fuel, coal stokers were installed in December, 1942, and were equipped with day-time pressure controls and a day-night timer with a hold-fire switch.

Thermostatic Control

Prior to the installation of the stokers, a motorized valve had been placed on the steam main supplying the office radiation. This valve was opened and closed by thermostats located on the east and west sides of the office on the outer walls, between windows. The control wiring was so

arranged that both thermostats had to be satisfied in order to close the main valve, and a drop in temperature at either side would cause the valve to open. The piping was such that the north half could have been valved separately from the south half, but it was not possible, without installing considerable additional piping, to separate the east half from the west half.

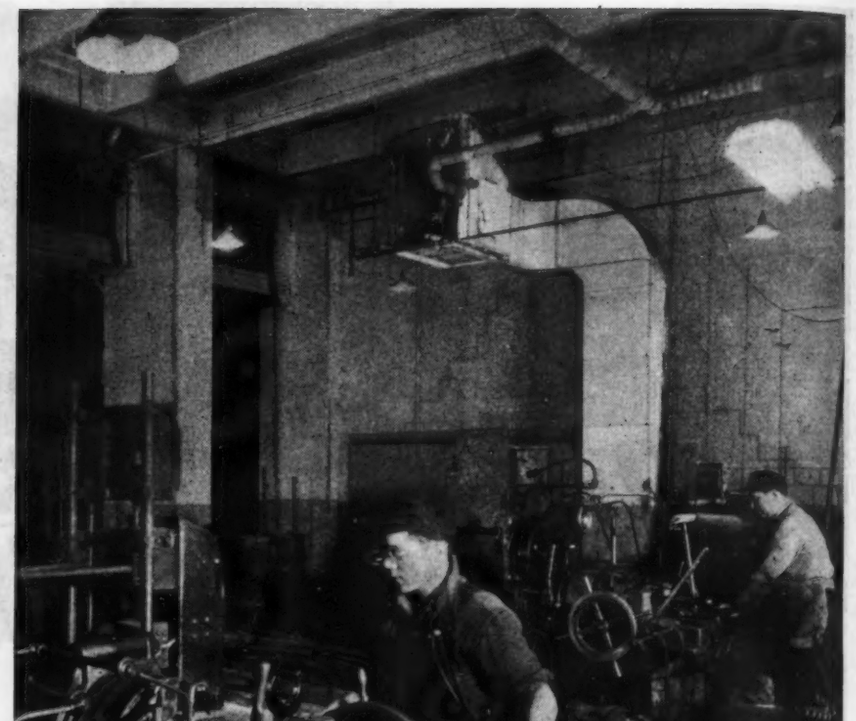
The result of the pre-war plan, therefore, had been that, when the sun was shining in the morning on the east side of the office, the west thermostat was the real control, and, steam being nevertheless equally distributed in the entire system in order to establish a comfortable temperature on the west side, the east side would overheat from added solar radiation. Differentials of several degrees between the two sides were not uncommon, and if the wind happened to blow on the shadowed side, this differential would increase substantially. The reverse situation would take place in the afternoon hours, the west side becoming overheated in order to establish a comfortable temperature on the east side.

This daily cycle of temperature changes naturally caused undesirable discomfort to office workers. An ideal office heating system would have to take into account, however, not only all of the variable physical features of the building but also would have to be adaptable to the conflicting idiosyncrasies of human beings, best described by the rhyme "some like it hot, some like it cold." Such an ideal is obviously impracticable of attainment in open office space, but any means for subdividing the heat control into units smaller than the original 20,000 square feet would be a step in the right direction.

Separate Controls

There are approximately 47 radiators involved in this office space. A study of arrangements, exposures, and partitions resulted in a decision to establish 18 separately controlled zones. The largest zone consists of a battery of four radiators placed under the windows of two adjacent 16-ft. bays of outside walls. The smallest zone consists of the telephone switchboard room where incoming trunk calls only are handled, and which occupies only about 65 square feet.

In each zone a thermostat was placed on a column about 16 feet inward from the outside wall, facing toward the window. Each radiator in every zone was equipped with an electrically operated steam-supply valve, with not more than four radiators subject to the control of any one zone thermostat. A few radiators located in stairways, locker rooms, and toilets are not thermostatically controlled, as rapid air changes in these areas preclude any possibility of overheating. The large motorized valve on the steam main supplying the entire office space was placed under clock control with bypass switches to hold it open for groups working at night, and also to close it for Sundays, holidays, or repairs during working hours.



Efficient operation of each overhead unit heater in pipe-threading shop is automatically obtained by a thermostatic control near floor level inside air duct that delivers cooler floor air to heater

This arrangement has produced satisfying results. Because process steam is required in the factory for longer periods than the office is occupied, steam is available for office heat whenever it is required. Normally, the main valve opens at 7 a.m. and finds practically all of the 18 individual zones calling for heat. The boiler room staff has learned to anticipate this surge of demand, which occurs only at a fixed time, and is prepared to handle the load. During the day, each zone may open and close a dozen or a hundred times, but at no time will any heavy demand suddenly lower the steam pressure that must be maintained for the process work. Temperature variations during the day in any compass exposure can be held within extremely narrow limits. At 5 p.m. the main valve closes, and no steam is admitted to the office main again until 7 o'clock the next morning, except in severe weather, when the watchman opens the main valve by manipulating the bypass switch for such time as it is necessary. Complaints from office personnel relative to heat have decreased at least 80 percent. The balance of the complaints are usually made up of individual opinions as to what constitutes comfortable heat.

Concealing the Wire

It is interesting to note that the low-voltage wiring extending from radiator valves at the outside walls to the zone thermostats was placed in grooves cut into the back of strips of linoleum. These strips were removed from the concrete floor over which they had been laid, then were grooved with an abrasive wheel on an electric hand tool, and relaid with very little trouble. Typical mushroom-top concrete columns made it impossible to drill up or down to conceal the wiring on either adjacent story of the building.

Another opportunity to save fuel was found in the existing arrangements for heating the sprinkler tanks. Two wood tanks, one of 30,000-gal. capacity, and one of 25,000-gal. ca-

pacity, are heated by the typical gravity system of circulation through an indirect heater located inside the building close to the tank and supplied with steam from the plant heating system. As is not unusual, these heaters are relatively inaccessible, one being located on a platform in an elevator shaft between two elevators, and the other in a penthouse that may be reached only by climbing a ladder through the top of a freight elevator and up the wall of the elevator shaft. Under such circumstances, the thermometers, which are installed on the cold side of the circulation, are obviously not going to be looked at very often. In order to be safe, plenty of heat has been supplied to the heaters. Moreover, the heater steam traps were found bypassed so that failure of a trap would not prevent steam from reaching the heater. Since the heaters are rated to heat the tanks properly under extreme temperatures, such wide-open conditions were consequently producing tank temperatures of 60 to 80 deg. F.

In addition to an extravagant waste of heat both through the traps and by radiation from the tanks, it is unfortunately true that the life of a wood tank varies inversely with the temperature of the water it contains. There was involved, therefore, in this needless overheating of large volumes of water not only a heavy loss of coal but also a shortening of the life of the wood sprinkler tanks.

Need for Check

A need for thermostatic control of the sprinkler tank temperature was indicated with some added reliable check on the performance of the thermostat. Consultation with the engineering section of the insurance underwriter's staff resulted in agreement on the specific equipment that would be acceptable. A thermostatically operated steam valve was installed in the steam supply line to each heater. A portion of the cold-water section of the circulating pipe was increased in size sufficiently to permit the introduction of two "wells," into which are inserted thermostatic tubes, one for control of the steam valve, and one for attachment to a remotely located thermometer. By the use of separable wells, or open-ended tubes, it is possible at any time to remove the sensitive tubes for inspection or repairs.

The heater steam valve, set in this instance at approximately 40 deg. F., is opened or closed by the temperature of the water descending by gravity into the standpipe, from whence it flows through the heater before returning to the tank. On a moderate winter day with bright sunshine, a large portion of the required heat will be obtained from the sun, and the small bypass in this type of valve supplies whatever little steam is required.

A remote indicating thermometer has been placed on the wall in a location that is regularly a part of the watchman's rounds. This thermometer is connected to the aforementioned sensitive bulb located in the second well in the circulating pipe. The temperature of the water in the standpipe can thus be readily observed on each trip made by the watchman, who must record at least one reading on his daily report. Any progressive drop in temperature below 40 degrees that might be caused by a mechanical failure of any sort can then be checked and corrected before it has had a chance to do any serious damage or to impair the function of the sprinkler system. Considerable saving of fuel is predicted for this installation, and although actual savings are difficult to determine, the difference in water tank temperature seems to indicate a saving in tank replacement and coal that will pay for the equipment in a few years.

The third spot in which it seemed possible to make some definite fuel saving by automatic heat control was in the pipe-threading shop.

Located in a remodeled building, this shop has an area of about 10,000 square feet and a ceiling height of 22 feet. In order to prevent stratification, the air is picked up through cold air ducts at a point about 2 feet above the floor and is circulated through large unit heaters located about 14 feet above the floor. Low-pressure steam is supplied to the unit heaters from the central heating plant in an adjacent building. Manual control of the three unit heaters meant that they usually would be in operation nearly all the time, day and night, with resultant overheating and waste of fuel.

Automatic temperature control equipment was therefore installed. The 440-volt fan motors in the unit heaters are now controlled, through relays, by remote-control thermostats. These thermostats have their sensitive bulbs located inside the cold-air ducts about 18 inches from the bottom, where they are not subject to disturbance from occasional drafts. A clock control, of the same type as that used on the main steam valve for the office, is used for a master control in the pipe-threading shop. In this case, however, instead of operating a valve, the clock makes or breaks the power supply to the circuit, which, through the thermostats, feeds the low-voltage holding coils in the relays. Thus, the unit heater fans cannot be started during the "down" period except by bypassing the time control. This bypass switch is operated by the watchman in severe weather, or by the shop foreman whenever his shift works beyond the normal shutdown time.

Savings Realized

Of the three heat control projects discussed, only two, the sprinkler tanks and the pipe-shop control, can probably be considered as possible of amortization solely by actual savings that will eventually result from their installation.

The office project is justified by the fact that it has been possible to achieve a reasonably accurate control for office heating on a one-pipe steam installation, with substantial coal savings at a time when coal should be valued, not by its dollar costs, but by the value of what can be done with it that could not be done without it.

When You Get a FACTORY Renewal Notice—

Please act promptly. Lack of paper has brought about a subscription waiting list. If you delay, your name is likely to be taken from the file and someone now on the waiting list will get the subscription. Then, when your order comes in, you may have to wait several months before you can get FACTORY again. And we shall not be able to supply the copies you have missed. It will help us keep things running smoothy if you will send in your subscription renewal as soon as you get the first notice that it is due.

Overhead Platform Gives Low-Cost Work Space

PHILIP G. SWANSON, Plant Engineer, American Transformer Company, Newark, N. J.

WHEN A SUDDEN DEMAND arose a year ago for 3000 square feet additional working space for assembly and testing operations on small hermetically sealed transformers in Plant No. 2 of the American Transformer Company, Newark, N. J., it posed two questions:

1. What could be done quickly in a building situation tightened by war controls?

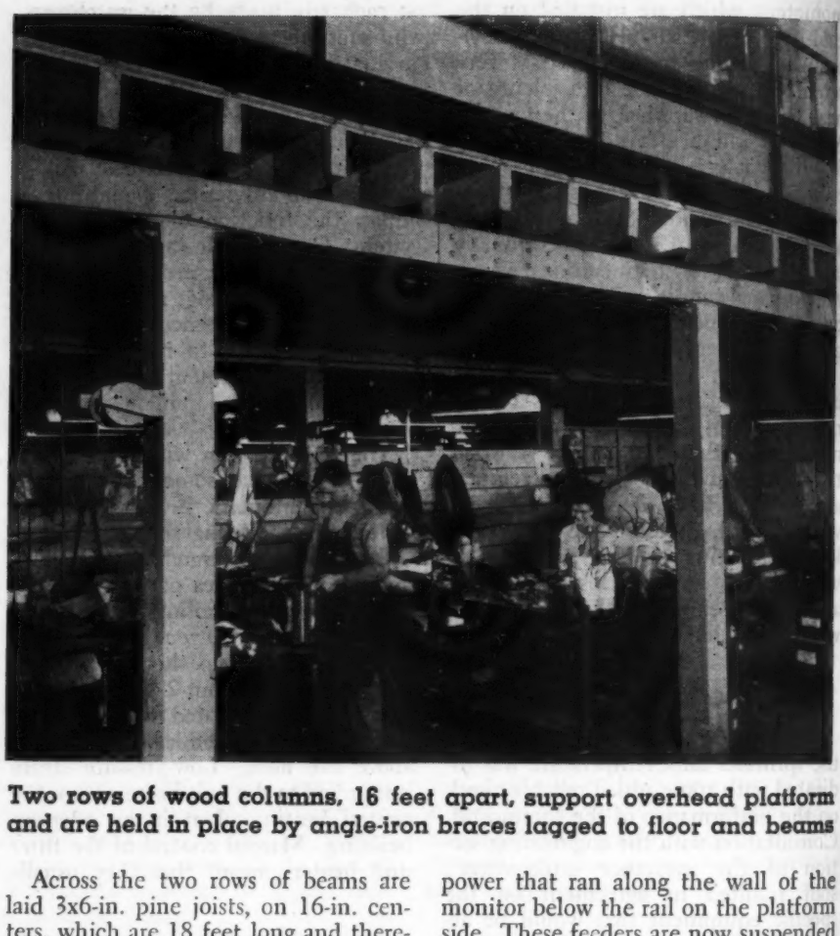
2. How to do it without disrupting existing operations?

The first question was answered by a decision to take to the air in existing plant area and build an overhead platform in the 30-ft.-high monitor section that runs the length of the main building. The answer to the second question involved careful and accurate design and fabrication of the structural elements away from the location so that they could be assembled at the location with a minimum of effort and least interference to production.

It was decided to erect an 18-ft.-wide platform for a length of 180 feet along one side of the monitor area, which itself is 40 feet wide. Although the building is of steel-frame construction, the platform had to be constructed of wood because of the impossibility of obtaining structural steel shapes. This war limitation, however, made the job of fabrication easier.

Simple Design

The design of the platform structure is simple. It starts at the floor with two parallel rows of vertical spruce posts, 8 inches square by 8½ feet high, spaced on 10-ft. longitudinal centers. The rows run 16 feet apart. Each post is held in place by two 8-in. lengths of 2x3x¼-in. angle-iron that are placed on opposite sides of the post and are lagged both to the post and to the concrete floor. On each row of posts, horizontal spruce beams of the same cross-section as the posts are laid end to end and similarly held in place by angle-iron brackets. Wherever the beam ends could not be made to meet at the posts, they are butted and tied together by steel fish plates.

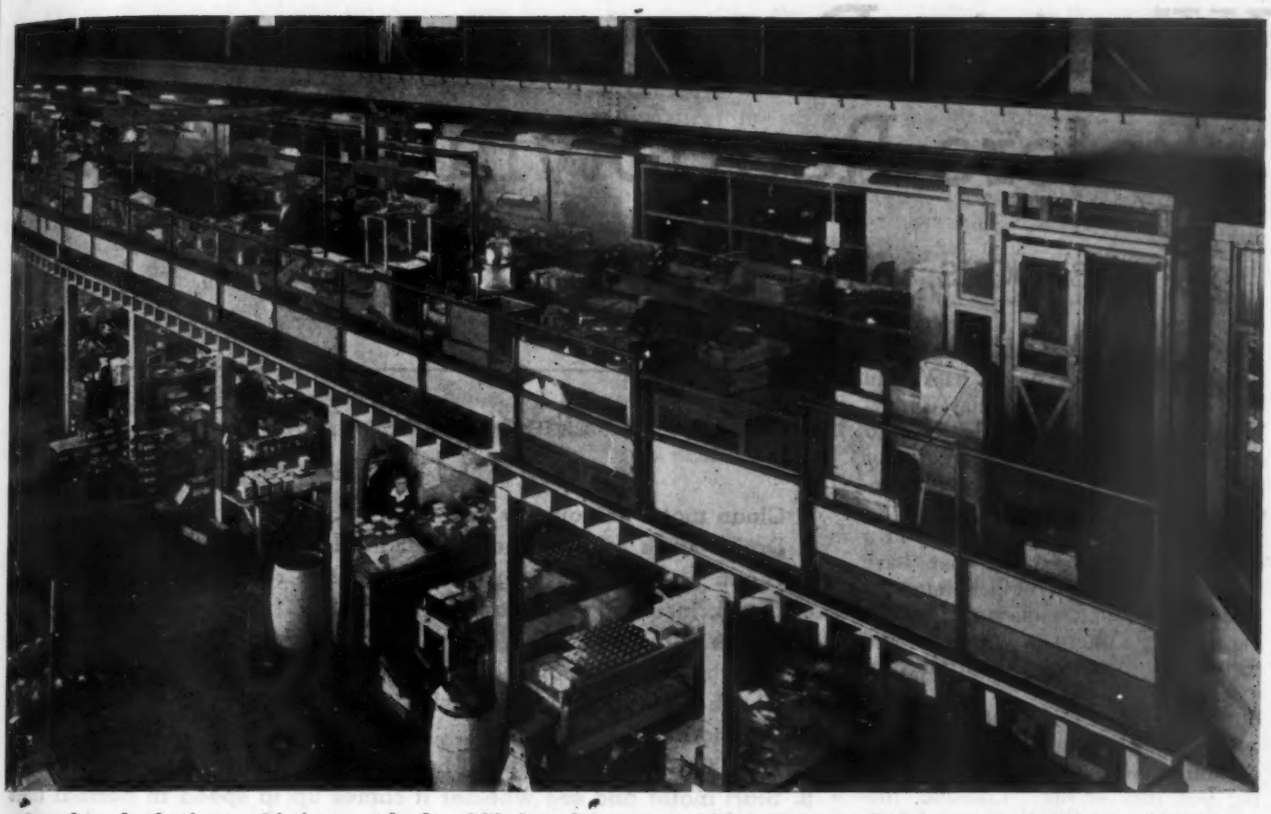


Two rows of wood columns, 16 feet apart, support overhead platform and are held in place by angle-iron braces lagged to floor and beams

Across the two rows of beams are laid 3x6-in. pine joists, on 16-in. centers, which are 18 feet long and therefore give 1 foot overhang on each column side. A single row of joist bridging runs longitudinally in the center of the platform width. The platform flooring consists of a single layer of ⅞x6-in. tongue and groove yellow pine nailed to the joists and running lengthwise of the platform.

The floor surface of the platform is 9 feet 9 inches from the main floor, and is 15 feet 7 inches below the under side of the roof trusses that support the lower roof on each side of the monitor. This gives ample clearance for operation of the 5-ton electric traveling crane that runs the length of the monitor and whose rails are 10 feet 3 inches above the platform. It was necessary, however, to remove the three bare copper feeders for crane power that ran along the wall of the monitor below the rail on the platform side. These feeders are now suspended from the top of the monitor, over the clear area, by attachment to the roof trusses on 20-ft. centers, with the idea that no broken feeder can ever reach the main floor.

The side of the platform directly under the wall of the monitor is enclosed along its complete length by a screen of wire hardware cloth nailed over wooden studs that extend from the flooring to the lower roof. The other side of the platform, projecting almost to the middle of the monitor floor, has a standard 42-in. iron pipe rail running along its entire length, except for a swinging 4-ft. gate at each end. These gates were provided to permit hoisting 4-wheel trucks filled with new parts or finished assemblies up from or down to the main floor.



Overhead platform, 18 feet wide by 180 feet long, provides extra working space for 60 employees

The pipe rail is likewise screened to the top with hardware cloth to prevent material falling on workers below. A stairway at each end of the platform provides access from the main floor. All material used in erection of the platform, except the hardware cloth, lumber, and fastenings, was obtained from plant salvage.

During the erection of the platform, which required two weeks, other production assembly work was being carried on below on the main floor with only minor interruption. All lumber was cut to size outside the building, by two carpenters. In the meantime, the floor layout was marked, and holes were drilled in the concrete floor for lagging. Posts were then brought in, set in place, and anchored to the floor. Beams followed, and as they were set in place, helpers lagged them to the posts.

As soon as 20 lineal feet of beams were in position, other carpenters began installing joists, and as this construction gained footage, other men laid the flooring. While this work progressed, mechanics cut and assembled the pipe railing. Electricians followed up with conduit and wiring for lighting and various d.c. test voltages. Simultaneously, other men installed prefabricated wood assembly benches along each side of the platform. Fluorescent fixtures were hung along the inner side of the platform from specially designed brackets clamped to the bottom of the crane rails. Fixtures along the outer side of platform were hung from pipe racks fastened to the workbenches by screwed flanges. Lights were installed, too, for workers under the balcony. Compressed air lines and outlets also were provided on the platform. The stairways were prefabricated in the carpenter shop, brought in, and quickly set in position. The job required five carpenters assisted by five helpers, five electricians, and four mechanics.

Up to 60 employees are being comfortably accommodated on this platform. The work is fed to benches on both sides from 4-wheel trucks that are hoisted to the platform and pushed up and down the middle aisle. Completed work is disposed of the same way. The platform is amply warm in winter in a general shop area that is heated by unit heaters. In the warm summer months there is no unusual discomfort, because of ventilation afforded by the ventilating sash in the monitor overhead, augmented by fans strategically placed on the platform.

When the platform was first built, it was intended to be only a temporary measure. The expedient has proved itself so satisfactory, however, that it is now being considered as a permanent work area.

EVERY MONTH, AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to WHAT'S NEW IN EQUIPMENT (page 140) . . . a summary of LABOR DEVELOPMENTS (page 194) . . . things YOU WANT TO KNOW more about (page 186)

What to Do Before Reapplying Motors

W. T. BROOKS, Motor Division, General Electric Company, Schenectady

PUTTING AN IDLE MOTOR back into service, or applying one that is now in use to a new job, should serve to remind the user of the importance of proper storage conditions and adequate maintenance programs.

Motors that have been stored in a clean, dry location, and that have been protected from sudden temperature changes and consequent sweating, against alternate freezing and thawing, and against the entrance of rodents, should be in as good condition as when they were stored. They will probably require only brushing off and a visual inspection before being put into service. Likewise, motors that have been in use and have been receiving adequate inspection and maintenance service need only have this service continued.

Stored motors that have gone without any care may require a thorough overhauling before reapplication. That applies also to neglected motors.

Inadequate Inspection

In many instances, unfortunately, too little time and too little manpower have been available to give motors adequate maintenance and inspection, either before reapplication or while doing a new war job. Consequently, maintenance is becoming more important every day. A thorough job of inspection and reconditioning will be a necessity if motors that have been neglected are expected to operate satisfactorily on another application. Some motors will have been in storage, or idle, for weeks or months when they are again called upon to start turning the wheels of war or of peace.

In addition, they must be properly applied with respect to horsepower, speed, voltage rating, degree of enclosure, and other characteristics.

Therefore, before reapplying a motor it must be inspected and, if necessary, reconditioned. The thoroughness of inspection will depend on its recent service record. If the motor has been in continuous service, or if it has been stored for several months, an especially thorough inspection is decidedly in order. The table lists the points that should be checked by the inspector.

The results of this inspection will indicate what measures are required to put the motor in good operating condition. If repairs are needed, it must then be decided whether the owner has adequate facilities to do the work, or whether it could be done better by someone else. Many motor manufacturers have service shops, located in principal cities, that are prepared to make extensive repairs and replacements which will restore a motor to its original condition.

The following paragraphs describe the procedure to follow when making some of the tests mentioned previously. Also, they will suggest corrective procedures for the more prevalent motor defects.

When disassembling a motor, drain bearings containing oil to avoid waste and to prevent the oil from spilling on the windings. Keep the parts clean and in good order. Remove couplings, pulleys, pinions, and fans with a puller. Remember that severe ham-

Check These Points

ALL MOTORS

1. Clean motor thoroughly
2. Drain, wash out, and renew oil in sleeve-bearing housings
3. Clean out and renew grease in ball or roller bearing housings
4. Check insulation resistance
5. Check airgap
6. See that endplay of shaft is normal
7. Check clearance between shaft and housings of sleeve-bearing motors
8. See that shaft and bearing housings are free from oil and grease
9. Start motor and see whether it comes up to speed in normal time
10. See that oilrings turn freely
11. Check the operating speed
12. Check current input and compare with nameplate
13. Check motor for excessive vibration
14. Check bearings for heating
15. Check windings for any localized heating

COMMUTATOR MOTORS

16. Inspect commutator clamping ring.
17. Check brushes, renew any that are more than half worn
18. Examine brush-holders, clean if necessary
19. Make sure brushes ride freely in holders
20. Check brush pressure
21. Check brush position
22. Clean out undercut slots in commutator
23. Examine connections of commutator and armature coils
24. Inspect armature bands

mering or wedging is likely to injure other parts, as well as those being removed. Remove ball bearings from shafts only by means of a puller, as in Figure 1, maintaining uniform pull all around so as not to distort the bore of the race, or shave the shaft.

Rotors and armatures are to be lifted out, not dragged over the stator punchings or field poles. Wound rotors and armatures must be carefully handled and placed on proper supports to avoid damaging exposed insulation.

When a motor is being reassembled, the various parts should not be forced together. It is far better to find out why the parts do not fit, and avoid marring or distorting them.

After reassembly, check the airgap again and compare it with the previous values. Make sure that couplings or pinions are assembled true and with the face perpendicular to the shaft; that fans have been replaced; that lubrication has been provided.

Turn the rotor or armature by hand to see that it rotates freely. Apply voltage and operate the motor unloaded for awhile, noting ventilation, lubrication, speed, and noises.

Remove heavy dirt and grease from insulated windings with a stiff heavy brush, wooden or fiber scrapers, and cloths. Rifle-cleaning bristle brushes may be used to clean the air ducts. Dust and dirt may be blown off, using dry compressed air at moderate pressure (25 to 30 pounds per square inch). Take care to blow the dirt *from* the windings. If the dirt and dust are metallic, conducting, or abrasive, air pressure may drive the material into the insulation and damage it. Hence, for such conditions pressure is not so satisfactory as suction.

Grease, oil, and sticky dirt are easily removed with solvents such as carbon tetrachloride, gasoline, or naphtha. All these liquids evaporate quickly and, if applied too freely, will not soak or injure the insulation. Carbon tetrachloride is the best of the three for this purpose and is recommended because it is non-flammable. However, it must be used only in a well-ventilated room, since its fumes are toxic to some persons.

The cleaning fluid may be applied with a cloth or a paint brush, or it may be sprayed on.

Dry Before Varnishing

Although the insulation will dry quickly at ordinary room temperature after such cleaning, it is best to heat it to dissipate all moisture before applying varnish. A very effective method of heating is to pass current through the windings, using a voltage low enough to keep the heating within safe limits. Usually, 10 percent of rated voltage will be satisfactory for drying a.c. machines. Put thermometers on the windings to make sure that they are being heated uniformly. Temperatures should not exceed 90 deg. C., for Class A insulation.

Applying heat in this manner drives out all moisture, and is particularly effective on high-voltage motors, in which the insulation is thick.

Figure 1. Removing the ball bearing of a d.c. motor with a hydraulic jack. In this operation it is important to maintain a uniform pull all around, to prevent damage to bearing or shaft

Motors may be dried also by applying heat from an external source. Any one of several types of heating units can be placed around or in the machine, which should be covered with canvas or other material, leaving a vent at the top to permit moisture to escape. Circulation of warm air over all surfaces of the windings is essential. Heaters and baffles should be arranged so that a natural draft results, or small fans may be used.

Small motors may conveniently be dried in an oven, the same temperature limit being observed.

Insulation resistance measurements ought to be taken at intervals of four or five hours during the drying process, and heating should be continued until a fairly constant value of insulation resistance is reached. This value should approach that recommended by AIEE Standards for new motors, which is

$$\text{Megohms} = \text{Rated Voltage} \div [(\text{Rating in Kva.} \div 100) + 1000]$$

For practical purposes this value becomes 0.2 megohms for 220-volt and 0.4 megohms for 440-volt motors.

The more convenient way to measure this resistance is by the use of a megohmmeter, although if a 500-volt d.c. source is available readings can be taken with a voltmeter. Connect the ungrounded side of the system to all the motor terminals through the voltmeter, and the opposite or grounded side to the motor frame through a fuse of not more than 10-amp. rating. The insulation resistance will be:

$$R = r\left(\frac{E}{V} = 1\right), \text{ where}$$

R = Insulation resistance in ohms
E = Line voltage (d.c.)
V = Voltmeter reading
R = Resistance of voltmeter

Insulation resistance may vary over a wide range, depending upon moisture, temperature, and cleanliness of the machine, but it is a good indication of the general condition of the insulation and its ability to withstand the operating voltage.

Insulation resistance measurements are desirable before a high-potential test, to determine whether the insulation is ready for such a test; also afterward, to make sure that the high potential has not hurt the insulation.

While the windings are still warm, apply a high-grade insulating varnish. For severe acid, alkali, or moisture conditions, a black plastic baking varnish is best. For conditions where oil or dust is present, a clear or yellow varnish should be used. The varnish may be either sprayed or brushed on. For small motors, it is best to dip the

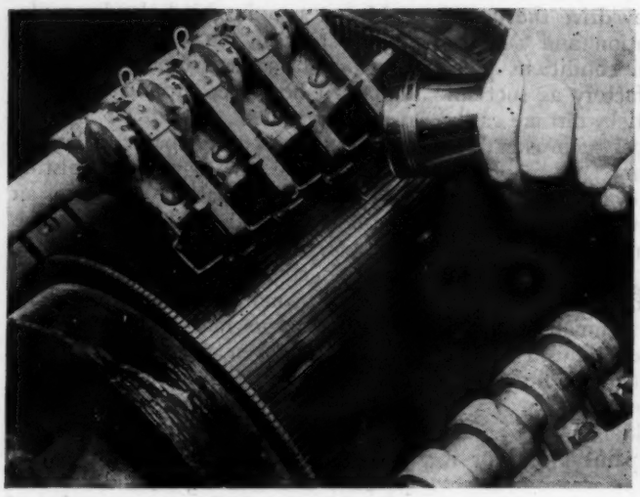


Figure 2. Left, brush holders are being carefully inspected, inside and out. Right, a pull on the flexible shunts will tell the maintenance electrician whether the brushes ride freely in the holders

windings into the varnish, cleaning off the adjacent metal parts afterwards with a suitable solvent.

Best results are obtained by baking for six to seven hours at 90 to 100 deg. C. after applying the varnish. If the operating conditions to be encountered are severe, or if the condition of the insulation is poor, a second coat of varnish, followed by baking, may be desirable.

Make a high-potential test after drying out any winding that has been wet, or after any changes or repairs have been made. New windings should successfully withstand a high-potential test of twice normal voltage plus 1000. There is some disagreement as to the proper value to use for motors that have been in operation for some time. It is reasonable to assume, however, that after thorough cleaning and drying, the windings of a used motor should withstand 150 percent of normal voltage for 1 minute.

The surface of the commutator must be smooth and clean and have a high polish. It must be free from unevenness, grooving, or pitting. Inspect commutators carefully for such defects as eccentricity, roughness, high mica segments, high bars, low or flat bars, loose segments, and loose armature coil connections. The repairs necessary for most of these defects are obvious, but complete information on the best repair methods may be secured from motor service manuals.

To clean a commutator properly, use a piece of dry canvas or other hard, non-linting material wound around and securely fastened to a wooden stick, and held against the rotating commutator. Lubricants must not be used at any time.

If the commutator is clean and polished, and the brushes have a perfect fit, the motor may be loaded at once. However, if the commutator is not polished, run the motor under a light load for several hours in order to establish a high, uniform polish on the commutator surfaces and a good fit on the brush faces.

The essential requirements for satisfactory brush operation are unform brush pressure to assure equal current distribution, free movement of brushes in their holders, and perfect fit of the brush faces on the commutator surface. Set brush holders so that the face of the holder is approximately $\frac{1}{8}$ inch from the commutator. Greater space will cause the brushes to wedge, resulting in chattering and excessive sparking.

Use Similar Brushes

If replacement of any brushes is necessary, the new ones should be exactly the same types and grade as those originally furnished with the machine. When there is any question consult the manufacturer of the motor.

Broken brushes usually are caused by the use of incorrect grades, or by mechanical defects in the commutator. Check both factors, Figure 2, if any brushes are broken.

Adjust brush springs so as to give equal pressure of each brush against the commutator. For most motors the proper pressure will be from $1\frac{3}{4}$ to $2\frac{1}{2}$ pounds per square inch of contact area between brush and commutator.

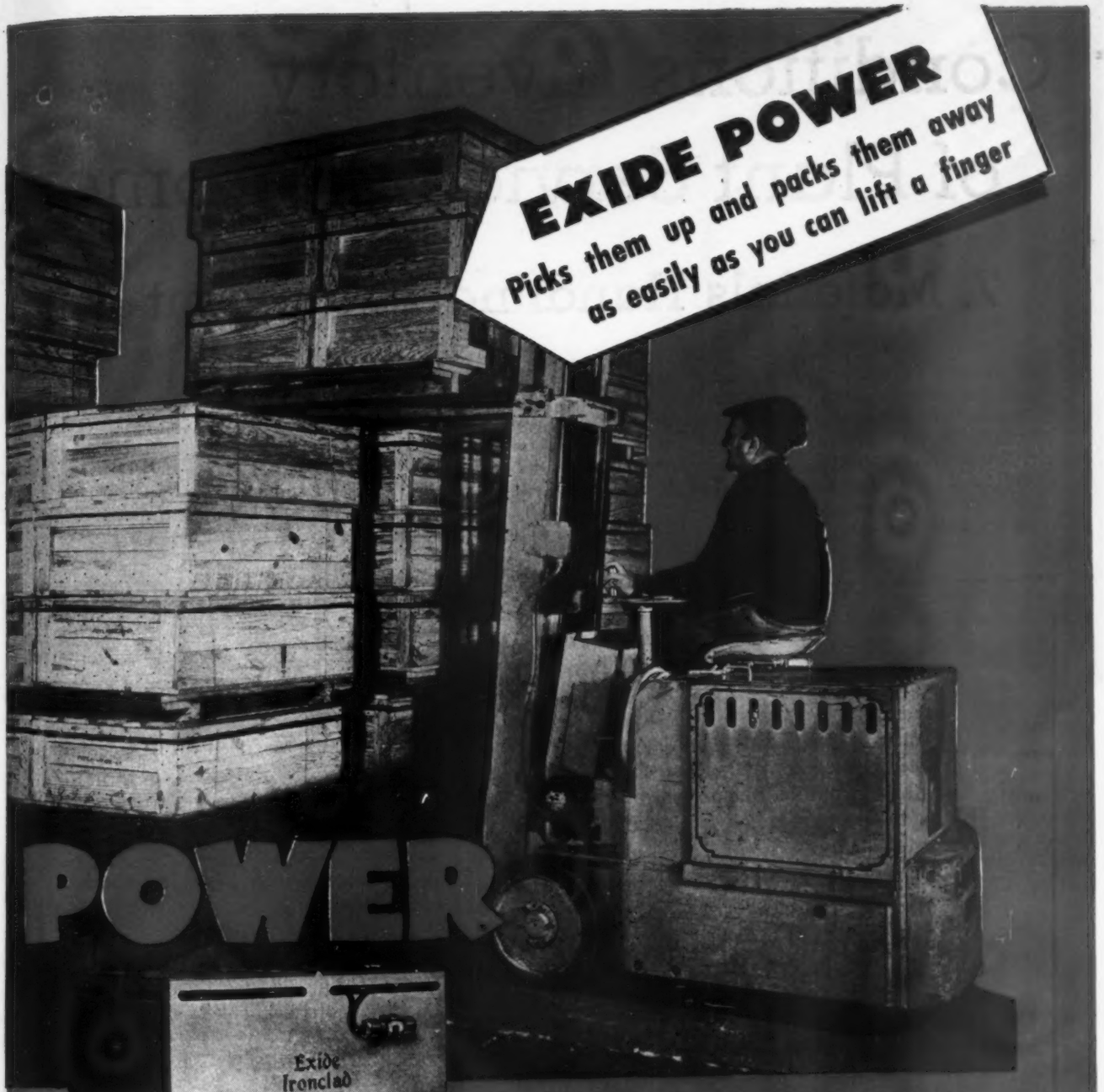
Wash out the bearing housings of sleeve bearings with one of the cleaning solvents previously suggested. If the motor has been torn down, before reassembling dry the bearing lining and cover the shaft with a film of oil. After assembly fill the bearing housings with a good grade of mineral oil having a viscosity of 250 to 350 seconds Saybolt at 100 deg. F. Oil of slightly lower viscosity may be used for motors with speeds between 1500 and 3600 r.p.m. These viscosities correspond to SAE No. 20 and SAE No. 10. However, turbine oil, not automobile oil, should be used.

Thoroughly clean ball bearings and their housings with a solvent, or with light oil heated to about 150 deg. F. After the bearing has been cleaned of old grease and is completely dry, put it back into the housing and apply new grease, either by hand or from a tube, over and between the balls. Do not fill the housing more than one-third to one-half full. Too much grease may cause excessive bearing temperatures, and the grease may leak from the housing onto the windings.

Use only high-grade grease. Its consistency should be a little stiffer than that of vaseline, maintained over the operating temperature range; its melting point should be above 150 deg. C.; it should be free from acid and abrasive matter, and the oil and soap should not separate under operating and storage conditions.

When reassembling the motor, fill any V-grooves in the housing lip with a fibrous, high-temperature sealing grease that will act as an additional protective seal against dirt.

Unless there are defects in the rotor or stator windings, such as open circuits or shorted or grounded coils, the reconditioning procedure outlined here should put the motor in proper condition for reapplication and for a long and useful life. To insure continued, reliable service from a reconditioned motor, make a lubrication and maintenance record card for it. See that it receives the periodic inspection and attention it deserves.



IN mills, factories and warehouses, unnumbered electric industrial trucks—powered by Exides—are lifting, hauling and stacking unit loads—helping to speed up production, to cut materials handling costs, to conserve vital manpower.

That so many Exide Batteries are employed in this important service, is due to three factors: Exides have the extra power needed to stand the heavy strain; their rugged construction keeps them on the job with minimum attention; and their ample reserves assure sustained speeds throughout each shift. You can always count on Exides for dependability, long-life and ease of maintenance.

Write us for a FREE copy of the bulletin "Unit Loads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50%... covers latest developments in materials handling... and includes actual case histories.

ARMY E NAVY

Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

Conditions Inventory of Plant Service Equipment

7. Materials Handling Equipment (Part III)

THE ARTICLE in the preceding issue listed the more important points to be covered when making a conditions inventory of jib, overhead traveling and truck cranes; electric, portable electric, and hand power elevators; and chain, electric and pneumatic hoists.

In the following pages the chief inspection points are given for a conditions inventory of commonly used types of monorail systems, industrial locomotives, electric and engine-driven tractors, and trucks.

Previous articles in this series were: 1. Motors and Generators (October); 2. Mechanical Power Transmissions (November); 3. Heating, Ventilating, and Exhaust Systems (December); 4. Electrical Distribution Systems (January); 5. Materials Handling Equipment, Part I (February); 6. Materials Handling Equipment, Part II (March).

MONORAIL SYSTEMS

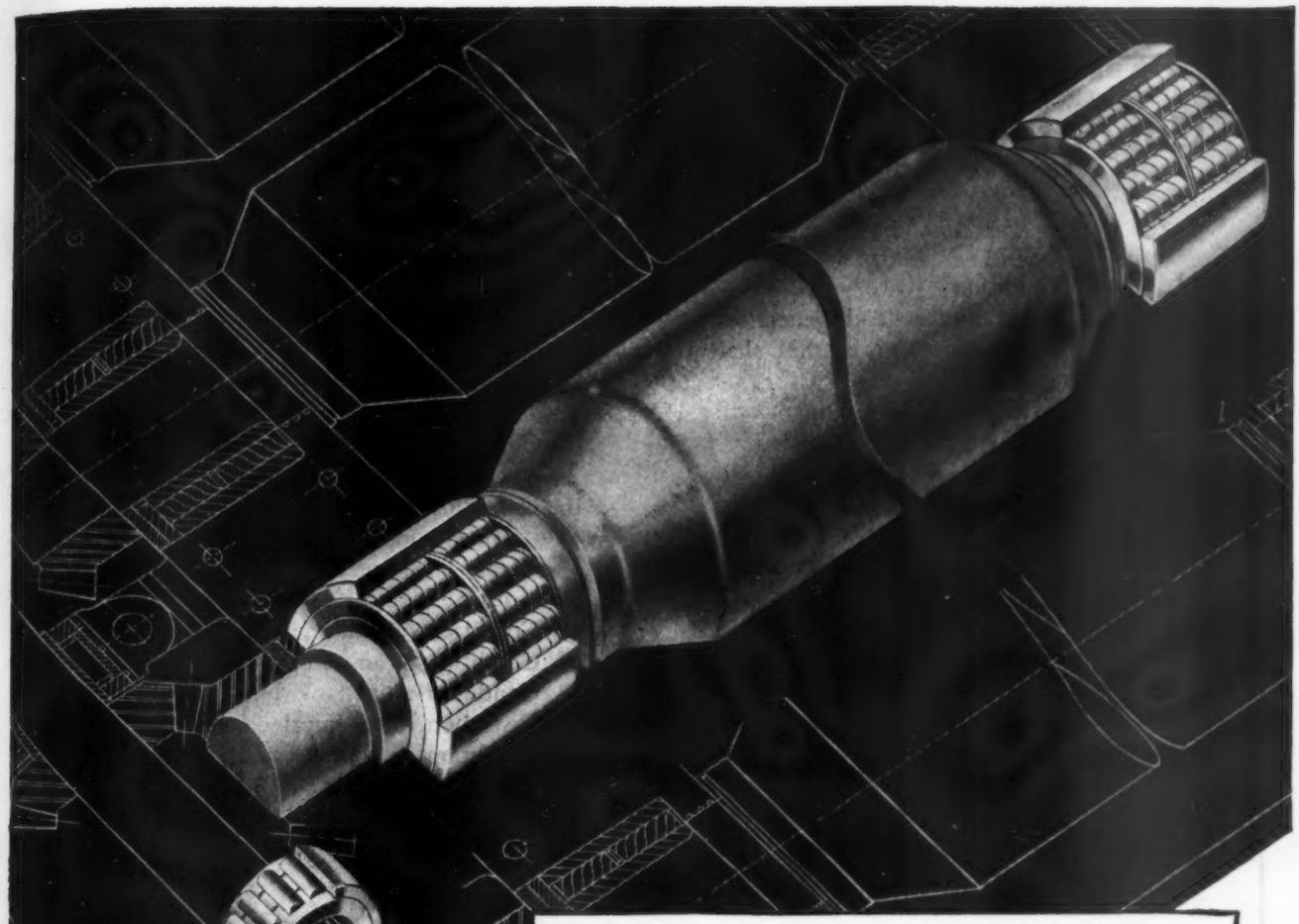
1. General condition
2. Condition of motors—winding, commutator, brushes, shafts, bearings, airgap
3. Pitted, burned contacts, loose connections in pushbutton or controller
4. Condition of contactors and overload protection
5. Condition, proper operation of limit switches and other safety devices
6. Condition of shoe or wheel collectors, conductors, conductor insulators and supports
7. Condition of drum, gears, shafts, bearings
8. Condition of brakes—wheels, shoes, disks, other parts
9. Condition of cable, need for replacement
10. Wear, deformation of chain, need for replacement
11. Condition of hook, load block, sheaves, shafts, bearings
12. Wear, other defects in trolley wheels, bearings, shafts
13. Condition of cab
14. Wear, condition of switches, operating mechanisms, locking devices
15. Condition of track, splices, hangers

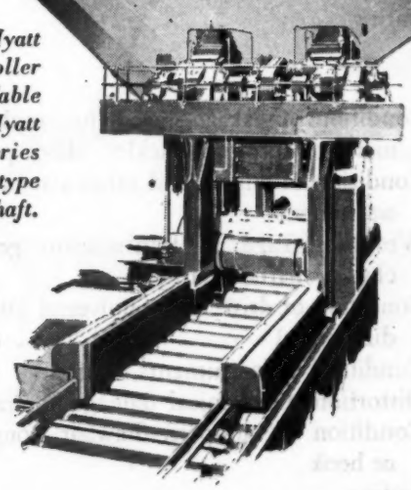
LOCOMOTIVES

Gasoline and Diesel

1. General condition
2. Condition of engine and associated equipment
3. Condition, proper operation of engine controls
4. Condition of clutch and operating mechanism
5. Wear, breakage of gears, shafts, bearings
6. Condition of meters and instruments, need for repairs or calibration
7. Corrosion, leakage, of fuel tanks, lines, valves
8. Condition of running gear—trucks, wheels, journals, bearings
9. Wear of drive chains, sprockets
10. Condition of brakes and rigging
11. Condition of air compressor, tank, lines, valves
12. Condition of couplers and rigging
13. Distortion, mechanical damage to frame
14. Condition of cab
15. Condition of handrails, steps
16. Condition of wiring
17. Condition of battery
18. Condition of head, cab, indicating lamps, sockets, reflectors
19. Condition, proper operation of electrical protective devices
20. Need for painting

Continued on page 132





Showing Hyatt Wound Roller type on Table Rolls and Hyatt 70,000 Series Solid Roller type on Line Shaft.

Hyatt Bearings are an integral part of the main mill tables on over 25 Blooming and Slabbing Mills.

TABLE ROLLS THAT TAKE A 20-TON IMPACT

BEARINGS: HYATT

When a 20-ton ingot is manipulated on the table rolls of a blooming mill, it's the bearings in the rollers that must share the terrific impact.

The capacity and mechanical excellence of Hyatt Roller Bearings on these tables—their ability to withstand the pounding and to remain unaffected by the heat, dirt and water encountered on this job—make them first choice of outstanding steel mill design engineers for both table rolls and line shafts.

If yours are problems of longer, trouble-free bearing service, of steadier or higher production schedules or of machine simplification, Hyatt engineers will be glad to consult with you.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION
HARRISON, NEW JERSEY

Conditions Inventory of Service Equipment *(Continued)*

LOCOMOTIVES

Diesel-Electric and Electric

1. General condition
2. Condition of motors and generators—windings, commutator, brushes, shafts, bearings, airgap
3. Insulation resistance of windings
4. Condition of engine and associated equipment
5. Condition, proper operation of engine controls
6. Corrosion, leakage of fuel tanks, lines, valves
7. Pitted, burned contacts, loose connections in electric controller
8. Condition of contactors, relays, interlocks, protective devices
9. Broken, damaged, resistors and insulators
10. Condition of manually operated switches
11. Condition of head, cab, indicating lamps, sockets, reflectors
12. Condition of wiring
13. Condition of battery, need for repairs or replacement
14. Condition of trolley—wheels or shoes, pole, support, insulators
15. Condition of meters and instruments, need for repairs or calibration
16. Condition of running gear—trucks, wheels, journals, bearings
17. Wear, breakage of drive gears, pinions, cases
18. Condition of brakes and rigging
19. Condition of air compressor
20. Condition of air tank, lines, valves
21. Distortion, mechanical damage to frame
22. Condition of couplers and rigging
23. Condition of cab
24. Condition of handrails, steps
25. Need for cleaning, painting

TRACTORS

Electric

1. General condition
2. Condition of motor—winding, commutator, brushes, shaft, bearings, airgap
3. Pitted, burned, defective contacts, loose connections in controller
4. Condition, proper operation of overload devices
5. Condition of battery, need for repairs or replacement
6. Condition of drive unit—gears, bearings, shafts
7. Condition of universal joints
8. Condition of wheels, axles, bearings
9. Cuts, other defects in tires
10. Condition of steering gear
11. Condition of brakes, need for repairs, or replacements
12. Breakage, need for replacement of springs, shackles, other parts
13. Distortion, mechanical damage to frame
14. Condition of bumpers, drawbar, coupler, or hook
15. Need for cleaning, painting

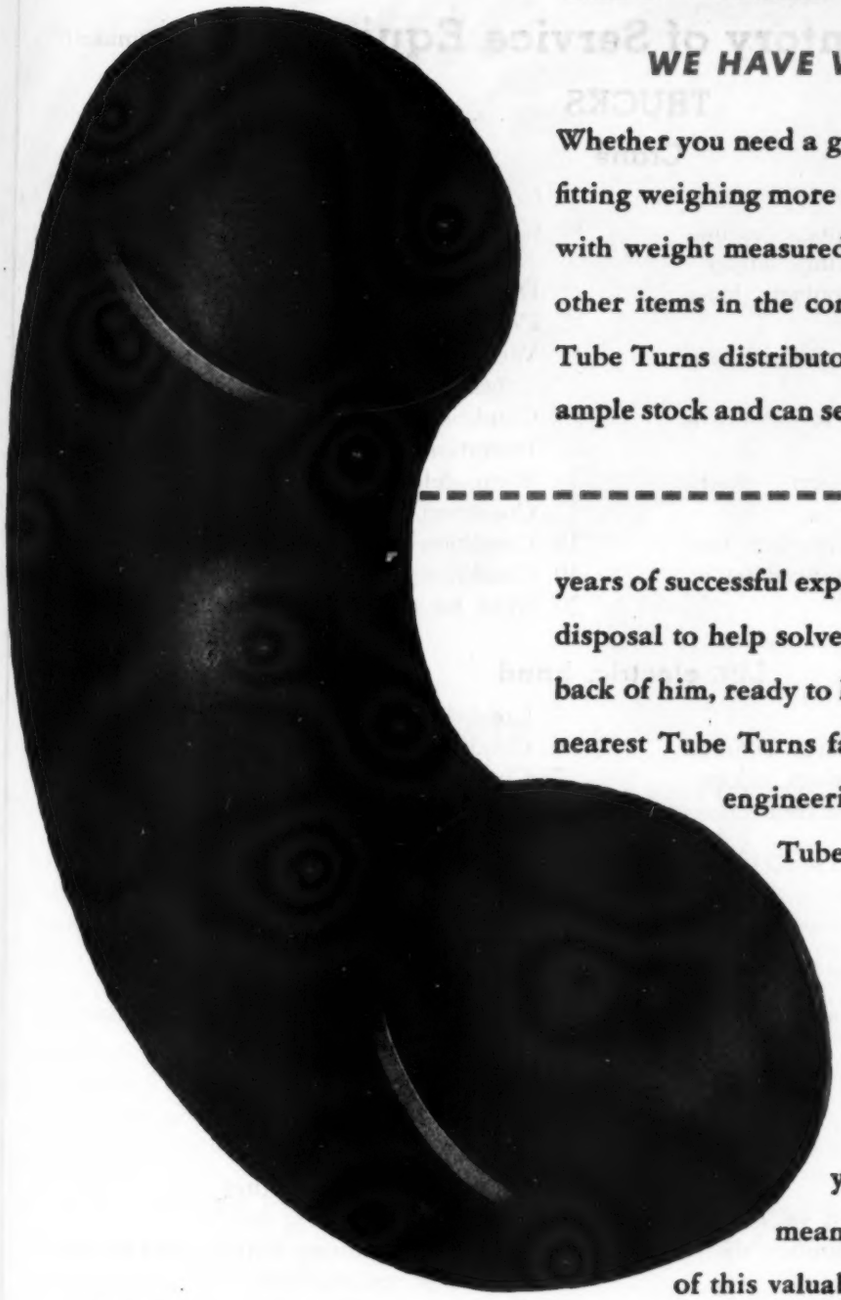
Engine-Driven

1. General conditions
2. Condition, wear, other defects in track shoes (caterpillar type)
3. Wear, condition of sprockets, track rollers, track carrier rollers
4. Condition of front idlers, shafts, bearings, release springs
5. Condition of wheels, axles, bearings
6. Cuts, other defects in tires
7. Condition of steering gear
8. Condition of brakes, need for repairs or replacements
9. Condition, breakage, need for replacement of springs, shackles, other parts
10. Condition of engine and other associated equipment
11. Wear, breakage of transmission gears, clutch, shafts, bearings
12. Condition of drive shaft, universal joints, differential
13. Condition of instruments, battery
14. Distortion, mechanical damage to frame
15. Condition of bumpers, drawbar, coupler or hook
16. Need for cleaning, painting

Continued on page 134

The odds are 4000 to 1

WE HAVE WHAT YOU WANT!

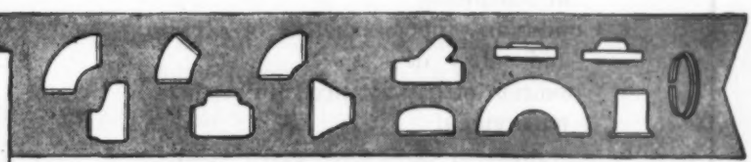


Whether you need a giant 30-inch Tube-Turn welding fitting weighing more than a half ton, a half-inch fitting with weight measured in ounces, or any of the 4,000 other items in the complete Tube Turns line . . . your Tube Turns distributor can supply you. He carries an ample stock and can serve you promptly. His

years of successful experience are at your disposal to help solve difficult problems. And back of him, ready to help at a minute's notice, are the nearest Tube Turns factory branch and the complete engineering staff and facilities of the Tube Turns factory in Louisville.

Remember—Tube-Turn welding fittings were the *first* welding fittings and are still the best. Let the new Tube Turns Catalog No. 111 show what 18 years' specialized experience means to you. Write for your copy of this valuable handbook today.

TUBE-TURN
TRADE MARK



THE COMPLETE LINE OF WELDING FITTINGS AND FLANGES

Selected Tube Turns distributors in every principal city ready to serve you from complete stocks.

TUBE TURNS (Inc.), LOUISVILLE 1, KENTUCKY. Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle, Los Angeles.

Conditions Inventory of Service Equipment *(Continued)*

TRUCKS

Crane

1. General condition
2. Condition of motor—winding, commutator, brushes, shaft, bearings, airgap
3. Pitted, burned, defective contacts, loose connections in controllers
4. Condition, proper operation of overload and safety devices
5. Condition of battery, need for repairs or replacement
6. Condition of drive unit—gears, shafts, bearings
7. Condition of wheels, wheel bearings, tires
8. Condition of driving brakes, need for repairs, replacements
9. Condition of steering gear
10. Condition, breakage, need for replacement of springs, shackles, other parts
11. Distortion, mechanical damage to frame
12. Condition of sluing unit
13. Wear, defects in hoisting drum, shafts, bearings
14. Condition of hoist and boom brakes
15. Distortion, general condition of boom
16. Wear, defects in sheaves, shafts, bearings
17. Condition, proper operation of limit stops
18. Condition of cable, need for replacement
19. Condition of outriggers
20. Need for cleaning, painting

Lift, electric, hand

1. General condition
2. Condition of motor—winding, commutator, brushes, shaft, bearings, airgap
3. Pitted, burned contacts, loose connections in controller
4. Condition of battery
5. Condition, wear of drive unit
6. Condition of wheels, axles, bearings
7. Cuts, other defects in tires
8. Condition of lift mechanism
9. Distortion, mechanical damage to frame
10. Need for cleaning, painting

Lift, hand

1. General condition
2. Condition of lifting, lowering mechanism
3. Condition of safety devices
4. Condition of wheels, axles, bearings
5. Distortion, mechanical damage to frame
6. Suitability for the service
7. Need for cleaning, painting

Lift and Platform

1. General condition
2. If motor driven, condition of motor—winding, commutator, brushes, shafts, bearings, airgap
3. Pitted, burned contacts, loose connections in controllers
4. Condition, proper operation of overload and safety devices
5. Condition of battery, need for repairs or replacement
6. Condition of drive unit—gears, bearings, shafts, universal joints
7. If engine driven, condition of engine and associated equipment
8. Wear, breakage of transmission gears, clutch, shafts, bearings
9. Condition of wheels, axles, bearings
10. Cuts, other defects in tires
11. Condition of steering gear
12. Condition of driving brakes, need for repairs or replacements
13. Breakage, need for replacement of springs, shackles, other parts
14. Distortion, mechanical damage to frame
15. Wear, general condition of hoist mechanism—motor or hydraulic unit, chains, sprockets, platform rollers
16. Condition, proper operation of hoist brakes and lowering control
17. Condition, proper operation of limit stops
18. Condition of tilt mechanism, control, brake
19. Distortion, general condition of load-carrying member—platform, forks, ram
20. Need for cleaning, painting

Versatile

in its application

...this

Fairbanks-Morse Motor maintains its protective features in any position!

The reversible frame of this Fairbanks-Morse Motor provides for mounting the conduit box on either side. The lead-in can be from top or bottom. The bearing arms can be mounted in any one of four positions, 90 degrees apart. Thus, the motor may be installed in any convenient place—in any position, and still retain its protective features.

Other features listed below assure low-cost operation, greater dependability, and longer life. Yes, this is the motor of tomorrow, ready for you today.

OTHER PLUS FEATURES

Protected Frame—Dripping liquids and falling particles excluded in any mounting position.

Crossflow Ventilation—Another exclusive feature in frames 224 to 365 inclusive. Air moves in both directions, providing a motor of uniform temperature. No hot spots.

Recessed Conduit Box—An innovation for neat installations. Choice of conventional box or frame recess with cover flush with frame.

Balanced Characteristics—Motor rated 40° C., with high efficiency and power factor, and excellent starting and accelerating torques.

Ball Bearings—Sealed in and protected.

AND THE EXCLUSIVE

Copperspun **ROTOR**

Centrifugally Cast in One Piece —*and of Copper!*

Write for information, Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY MORE WAR BONDS

Fairbanks-Morse

A name worth remembering

Diesel Locomotives · Diesel Engines · Generators · Motors · Pumps · Scales
Magnetos · Stokers · Railroad Motor Cars and Standpipes · Farm Equipment

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

FIFTY DOLLARS

Will be paid for the best Maintenance Short published in each issue of *Factory* until further notice. (Do not submit Shorts that deal with production processes.)

All other Shorts accepted for publication will be paid for at attractive rates.

Contributors may submit as many items as they wish. Mail yours today!

Prize - winning short this month, "Doormat Solves Floor Maintenance Problem" on page 138

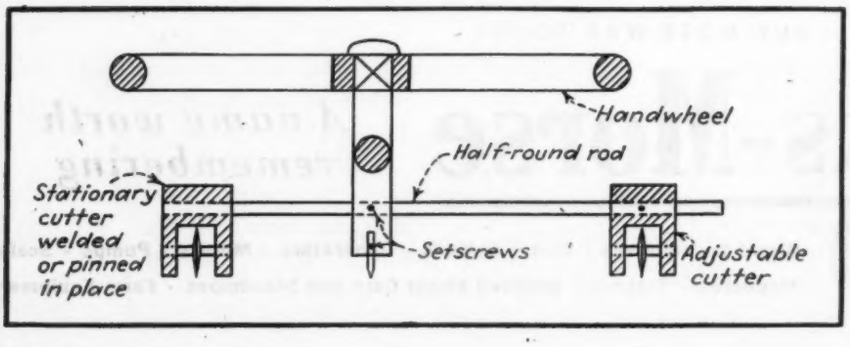
Simple Cutter for Washer-Type Gaskets

JOHN C. LAZUREK, Joliette, Quebec, Can.

A gasket cutter to be used with a drill press was illustrated under the above title in the February, 1944, issue of FACTORY. When a drill press is not available, or when maintenance men have to go from one department to another or from factory to factory, to replace defective gaskets, the portable cutter shown in the sketch will be found useful.

It can be made at trifling cost and, as will be seen, consists mainly of a handwheel and two pipe-cutter wheels. The bar, which holds the center point, is welded to the handwheel. In it is drilled a hole for the horizontal beam, which carries the cutters. A setscrew or thumbscrew is used to hold the beam in place at the required radius of the inner circle of the gasket, which is cut by the stationary cutter. The setscrew on the movable cutter allows the latter to be set at any radius to form the outer circle or vice versa. The center point also is adjustable to permit cutting various thicknesses of material.

A cleanly cut gasket can be produced by applying slight pressure to the handwheel and turning it slowly. It is advisable to lay the material being cut on a flat board or steel plate, in which a hole has been drilled the size of the center point. When the point is inserted in the hole it is unnecessary to tack the sheet down.

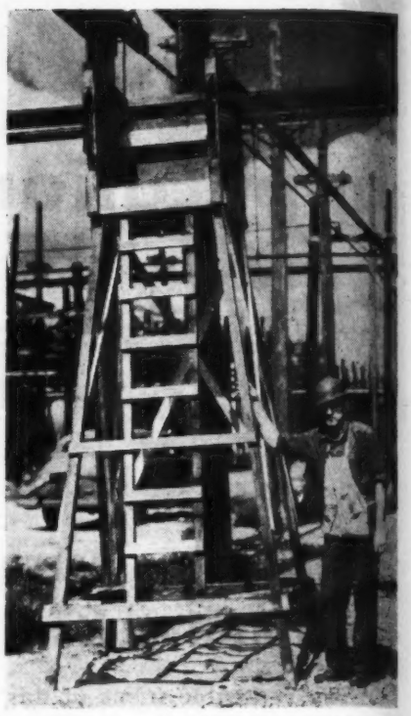


•

Platform Scaffold Skirted for Safety

G. G. FLEMING, Safety Director, General Chemical Defense Corporation, West Virginia Ordnance Works, Point Pleasant, W. Va.

A three-sided, sheet-metal "skirt" at the platform on top of a four-legged scaffold offers extra protection for workers in certain kinds of jobs. At our plant we use scaffolds of this type to protect repairmen working on overhead pipes carrying acid, in case the acid splashes while the work is being done.



Safety and convenience characterize this platform scaffold, designed and built by C. E. Denny, acid area carpenter at General Chemical Defense Corporation. The three-sided guardrail at top is covered with sheet metal to protect workers from being burned by splashes of acid from pipes being repaired

As shown in the accompanying picture, the scaffold is built to a height so that the sheet metal around the platform extends slightly above the danger line of the pipes. We also now have similar scaffolds of other heights, so that we can always choose one that will fit the job.

Although sturdy and solid, the scaffolds are light enough for two men to carry, and are kept in a storage space when not in use.

For added safety and convenience, a pocket for tools has been built inside the guard rail.

•

Solutions for Removing Rust From Tools

PAUL C. ZIEMKE, Oak Ridge, Tenn.

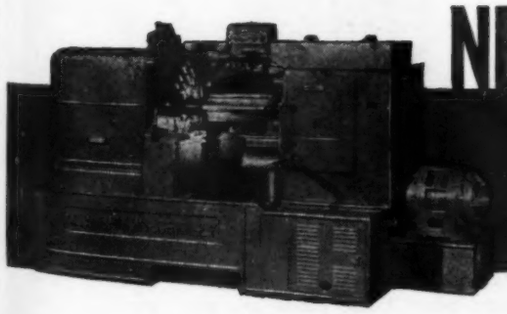
Tools used in and around operations required the use of acids or soldering fluxes

SOMETHING ~~NOTHING~~ CAN STOP THE ARMY AIR CORPS!

Poor equipment and too much of it will stop anybody's air force . . . failures that result in the loss of men and vital war materiél. Thanks to the unequaled performance of American Industry, we point with pride to the world's finest planes and the most versatile airmen . . . gaining air supremacy 'round the globe.

It takes tens of thousands of precision-built parts to put a plane in the air and a large number of the most vital ones are machined on New Britain multiple spindle chuckers and screw machines . . . automatics geared for large scale part production that meets rigid aircraft specifications for quality and quantity.

Many manufacturers will rely on these same methods in establishing a firm position in the competitive markets postwar . . . a time when speed, accuracy and price-per-piece will mean everything. Don't overlook the New Britain Sales-Engineer in developing your peacetime production plans . . . for he may be able to supply the answers automatically.



NEW BRITAIN AUTOMATICS

have a disagreeable habit of becoming badly fouled with rust, and in time they may become useless because of the corrosion set up in the steel.

Although this rust can be removed by rubbing the tools with an abrasive paper or cloth, it is not always convenient to use this method.

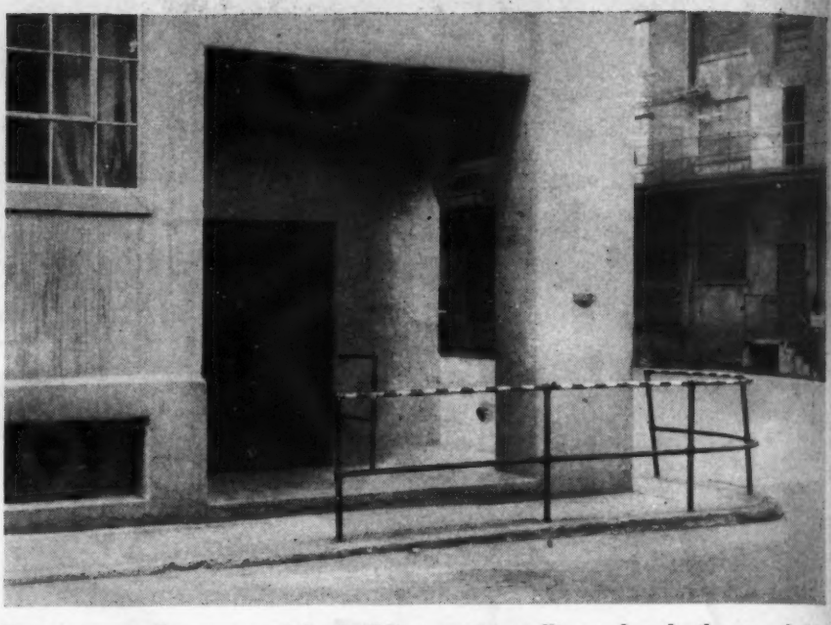
Rust can also be removed by immersing the tools in a solution of one tablespoon of ammonia citrate in a pint of water. If the solution is used cold, the action is likely to be slow, therefore the liquid should be heated for speedy action. The solution is sufficiently potent to be used for repeated applications.

Still another effective rust removing solution is composed of 9 grams of zinc powder and 9 grams of caustic soda. Rinsing the tools in clear hot water completes the operation.

•

Remodeling Corner Prevents Accidents

One of the large reinforced-concrete buildings built in 1925 in the Kodak Park plant of Eastman Kodak Company formerly presented a distinct hazard to pedestrians and motor vehicles at one blind corner, where a narrow sidewalk and roadway closely abutted the building on both sides. The sidewalk is so narrow that one of two persons walking abreast at this corner had to walk in the street, and persons coming in opposite directions frequently collided. To avoid these mishaps, walking in the street when approaching this corner became the popular habit for pedestrians, but one that added to the hazards already faced by motor vehicle drivers as they approached a corner they could not see around.



Cutting away the corner of the building, and installing a handrail around the corner reduce hazards both to pedestrians and to motor operators

The cutaway corner shown in the photograph was designed to eliminate the hazard. It has proved an effective solution, affording better vision both to pedestrians and motor drivers, and also providing more walking space. The hand railing helps to keep pedestrians on the sidewalk.

Similar cutaway corners have since been built into new Kodak Park buildings wherever the same traffic hazards were anticipated.

Doormat Solves Floor Maintenance Problem

A. L. HANDLEY, Supervisor of Standards, Hamilton Standard Division, United Aircraft Corporation, East Hartford, Conn.

Since all propellor blade operations are performed on machines or benches, the blade forgings must frequently be placed on, or lifted from, the floor, either by hand or with a hoist.

Some of these forgings, in their rough state, weigh well over a hundred pounds, and a great deal of effort is required to lower them manually to the floor, shank end first, without dropping them part of the way.

Dropping these forgings day after day in the same place in front of machines and benches had a very destructive effect on the wood block floor. The split and distorted wood blocks presented a safety hazard. In addition, dropping tended to damage the forgings.

To remedy these undesirable conditions, the wood blocks were removed from a small area and a built-up woven hemp doormat was put in their place, as shown by the illustration. Now the resilient mat breaks the fall of the forgings, without injury to them or to the floor.

From a maintenance point of view, these doormats mean more than just "Welcome."

Substitution of a woven hemp mat for wood blocks eliminated damage to floor and propeller blade forgings, when these parts are put down

DIAGNOSIS

Battery ailments, like those of the human system, must be diagnosed by an expert.

Proper diagnosis of your battery requirements is the first step in obtaining efficient, economical battery service. Gould field engineers are technical experts. They can give you authoritative decisions on what type and size of battery is best for your particular job.

Behind these men is the Gould organization with half a century of battery research and experience. Originator of such outstanding batteries as the Gould Kathanode and the Gould Plante, the engineering department can be depended on to translate the field engineer's findings into the proper installation.

Here is a specialized service at your command. We invite you to use it.

GLASSKLAD *since 1925*

Write Dept. 14 for Catalog 100 on Gould Kathanode Glassklad Batteries for Industrial Truck and Tractor Service.

GOULD

Since 1898 . . . THE BATTERY PICKED BY ENGINEERS

THE UNIQUE GOULD KATHANODE

One of a series of informative articles for users of industrial batteries

Gould Kathanode battery construction was originated in the United States 20 years ago. Basically it meant the use of a glass retainer against the positive plate surfaces, but Gould has developed it far beyond the original conception.

In the Gould Kathanode construction of today you get the famous long life Black Oxide active material, a grid designed to match active material life, and specially made spun glass mats which lock active material in place and protect this vital unit against service abuse.

The "Unit-Seal" envelop, a perforated rubber sheet, 60% porous, is then wrapped around the plate and mats—forming the now famous Gould Kathanode Positive Unit.

These features are important because in addition to being an efficient supplier of electrical power, a storage battery must be able to withstand whatever rough handling its service demands.

Gould design and construction, however, do not stop with perfecting the positive unit, for Gould engineers know that unless all parts meet service requirements, the failure of any one may make the entire battery inoperative

Important in this overall design : the negative plate. Gould uses an interlocking bar type grid. The negative active material is a highly porous, metallic oxide compounded to a special formula that assures close electrical contact with grid members.

Separation is effected by means of another Gould development, Durapor rubber separators. These have great porosity, deep channels, and thin backweb, without any sacrifice in strength or durability.

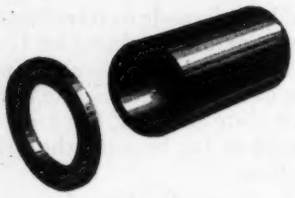
The element is then placed in a hard rubber or monobloc container. The cover, also of hard rubber, fits over this assembly and is sealed with a compound that resists vibration or cracking. A tight terminal post seal is made by using a soft spool type bushing, compressed between the cover and sealing mat.

This completeness of design, developed over 20 years of service with the Kathanode principle, has resulted in a better product, better for the user from all standpoints.

For Excellence in storage battery production at Depew plant

GOULD STORAGE BATTERY CORPORATION, Depew, N. Y., Factories • Atlanta • Chicago • Dallas • Depew • Leavenworth • Los Angeles • North Bergen • Rock Island • St. Paul • Sioux City • Zanesville

TOUGH JOB



made easy

The bearing wasn't very big . . . but it was important . . . and the cause of considerable trouble. The application was originally served by a steel washer and a plain steel sleeve. The shaft was copper tubing, perforated for irrigation purposes. The chief difficulties were . . . (1) in assembly with two separate pieces . . . (2) the constant maintenance and lubrication required . . . (3) the tendency for the bearing to turn with the shaft and work out of place.

A Johnson Engineer studied the requirements of the application and then designed a new bearing . . . square on the outside . . . round on the inside . . . with a flange. Then we produced these bearings from Johnson LEDALOYL Bronze . . . a product of powdered metallurgy.

The net results? We eliminated all lubrication problems by using LEDALOYL which is self-lubricating. The square OD held the bearing firmly in place. The addition of the flange simplified assembly and accommodated the end thrust.

All maintenance was eliminated and the new bearing cost less than 50% of the original assembly.

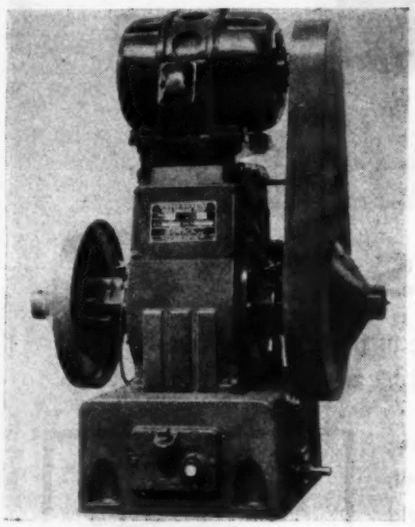
Isn't this the type of common sense engineering service you want on your bearing problems? We are ready and willing to assist you. Simply write to . . .

JOHNSON BRONZE
512 SOUTH MILL STREET
NEW CASTLE, PENNA.

WHAT'S NEW IN EQUIPMENT

High Vacuum Pump

No. 212 E. Microvac high vacuum pump is claimed to produce and maintain vacuum as low as five microns absolute pressure in continuous service. Oil-sealed rotary type, pump is small, lightweight, simple in design, rugged, and has both high volumetric



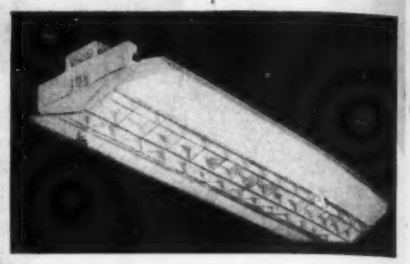
efficiency and large capacity, rated at 100 cu. ft. displacement at 350 r.p.m., according to the manufacturer. Employs only four internal moving parts—a shaft with keyed-on eccentric, a rotating one-piece piston and slide, and the hinge bars. Eliminates dead space or clearance, permitting the discharge of air at the end of each stroke to be complete. The pump is direct motor with V-belt drive, and mounted on an adjustable hinged base. F. J. Stokes Machine Co., Philadelphia 20.

Hand Cleansing Cream

Cleansing cream, called Den-Nex, is said to remove lacquer, paints, synthetic adhesives, inks and dyes, and other materials from the hands. Used after, not before, work. Worked into the skin like soap until absorbent substances are loosened, then rinsed off with water. Free of abrasive, scouring, or clogging substances, it is said to leave the pores open, the skin thoroughly cleansed, soft and smooth because of its lanolin base. Dennis Chemical Co., 2701 Papin, St. Louis 3.

Fluorescent Fixture

Eggcrate Aristolite fluorescent luminaire, combining lamp-shielding and glass-diffusion in the same fixture, is announced. Strong, efficient down-lighting through



eggcrate louvers, plus diffused side lighting through glass paneds is said to be provided. Has paneled and die-cut ends. Glass panels and eggcrates are separately removed for easy maintenance. Fixture is available for individual or continuous installation, and can be suspended from the ceiling, or mounted directly to same. For four 40-watt fluorescent lamps. The Edwin F. Guth Co., 2615 Washington Ave., St. Louis 3, Mo.

Lock Washers

Double coil spring lockwashers are said to have reactive spring pressure, resistance to shock, vibration, and severe service. Washers can be furnished in sizes for No. 4 screws up to 1-in. and larger bolts, in any finish. Double coil washers of light sec-

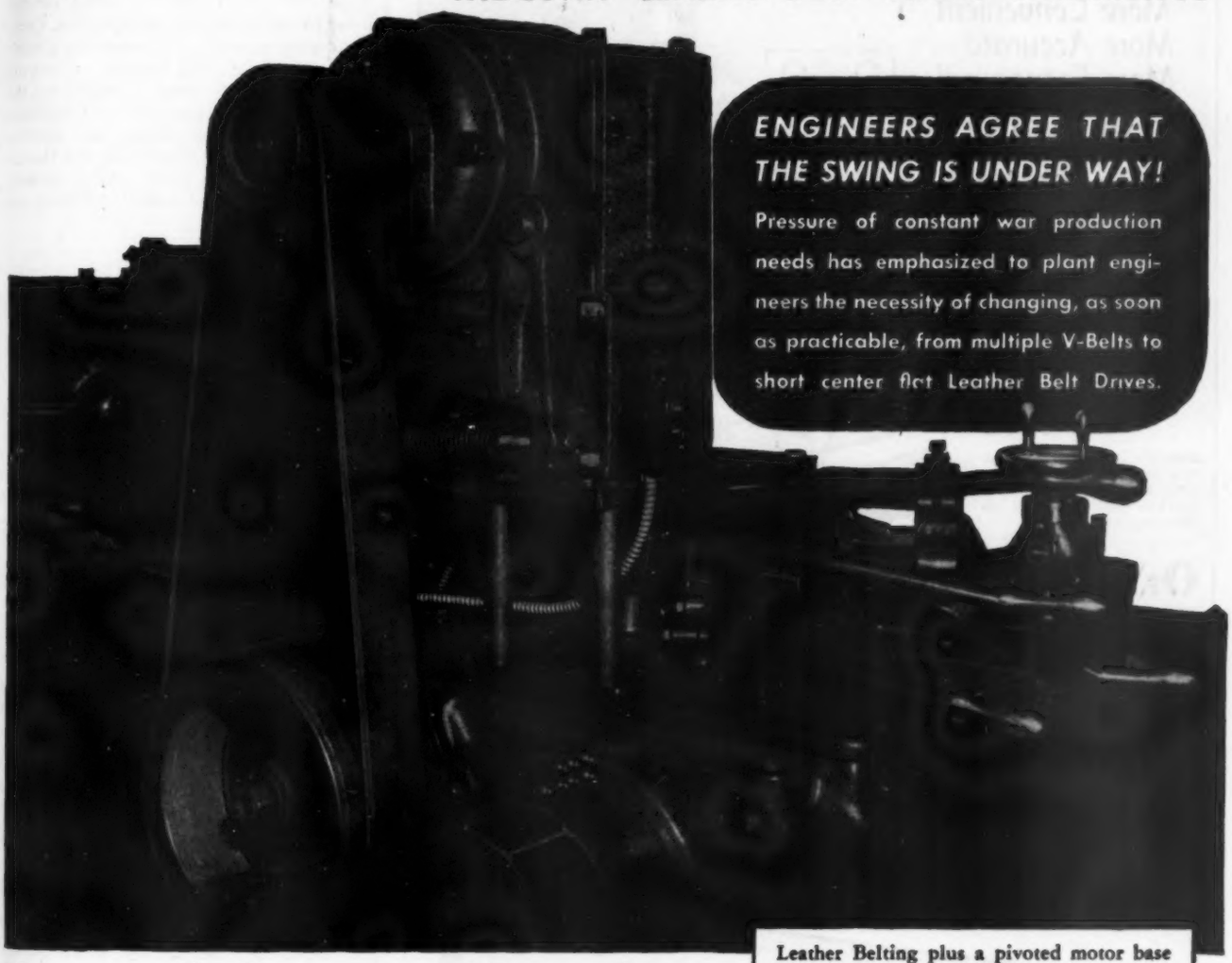
tions for special uses in the electrical and allied industries are also offered. George K. Garrett Co., Inc., 1421 Chestnut St., Philadelphia 2.

Electronic Indicator

Pressuregraph is claimed by the manufacturer to indicate, in linear response on the screen of a cathode ray oscillograph, the pressure-time curve of any internal combustion engine, pump air line, or any other enclosed system where pressure measurements are desired. Measures either static or dynamic pressures. Applicable to 2-cycle engines to show pressure-time curve of main cylinder or crankcase and also on aviation fuel test engines. In operation, the pick-up section of indicator

ONLY *Leather Belting* CAN DO THIS JOB PROPERLY

"INDUSTRY LEARNS BEST FROM EXPERIENCE"


ENGINEERS AGREE THAT THE SWING IS UNDER WAY!
Pressure of constant war production needs has emphasized to plant engineers the necessity of changing, as soon as practicable, from multiple V-Belts to short center flat Leather Belt Drives.

Leather Belting plus a pivoted motor base protect motor and machine bearings and permit the location of the motor in a convenient, out-of-the-way position.

You can do it *Better* with Leather Belting . . . *And here's why* . . .

Machine tool operators, as well as designers and builders — appreciate and count on the high coefficient of friction of Leather Belting. They also know that its great pulley-gripping power is permanent — a characteristic not found in any other type of belting. This unique gripping capacity permits peak or over loads without interruption. Leather Belting can withstand repeated shock loads, "giving" enough to protect motor and machine bearings. Such exclusive features are a few of the reasons why *you* can profitably

STANDARDIZE ON SHORT CENTER FLAT LEATHER BELT DRIVES

AMERICAN LEATHER BELTING ASSOCIATION • 41 Park Row, NEW YORK 7, N. Y.

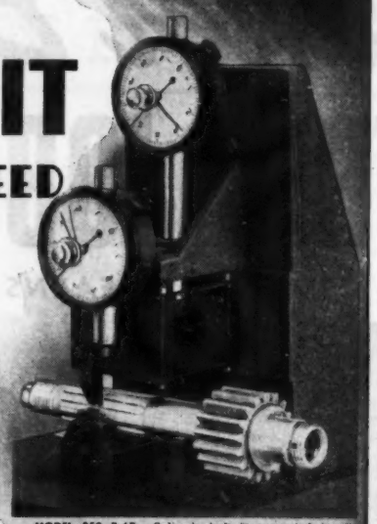
A GAGE BUILT-TO-FIT YOUR PARTICULAR NEED

Would be . . .
Faster
More Convenient
More Accurate
More Economical

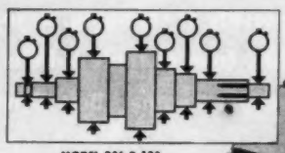
As For Instance...

SPLINES — Two splines, instead of only one, are inspected simultaneously with this Gage. Moreover, each spline is easily checked throughout its length to determine uniformity of width. Proper spacing of the splines could also be inspected in a similar manner.

Two simultaneous inspections save time.

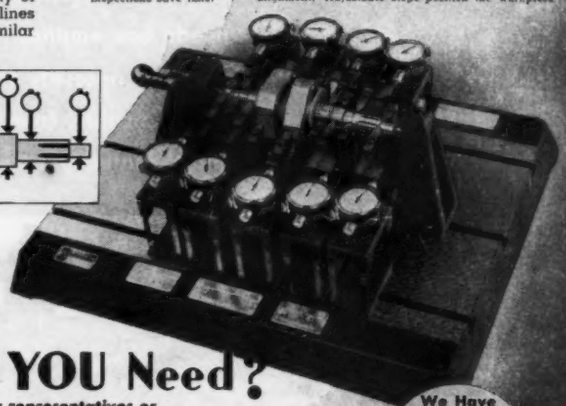


MODEL 259 B-67 — Splined shaft is supported for alignment. Adjustable stops position the workpiece.



MODEL 236 B-123

SHAFTS— This Gage is adjustable to take different diameters, and different lengths. Work is easily inserted between centers



Or..What do YOU Need?

Give your requirements to our representatives or send them to our sales engineering department

We Have Designed and Built Thousands of Gages to Fit Specific Requirements

FEDERAL PRODUCTS CORPORATION
PROVIDENCE 1 • • • RHODE ISLAND

★ ★ ★ ★ ★ FEDERAL ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

DIAL INDICATOR TRUISM —

Feeling a measurement is Relative

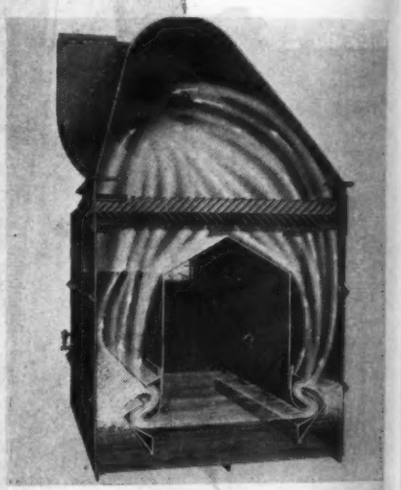
— Seeing it is Exact.

★ FEDERAL ★

is inserted in cylinder, chamber, or air line to be measured. Pick-up response is transmitted, after amplification, to the screen of a cathode ray oscillograph. An advantage claimed for the Pressuregraph is simplified operation; only one control is required, with one initial adjustment to compensate for temperature effects. Electro Products Laboratories, Inc., 549 West Randolph St., Chicago 6.

Dust Control Equipment

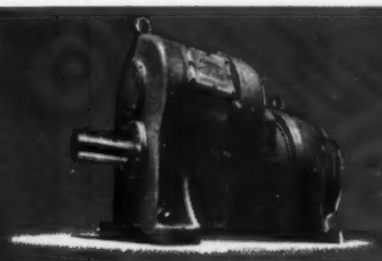
Type "N" Roto-Clone is based on the principle of hydrostatic precipitation. Compact, easy to install, and requiring a minimum of space, the absence of moving parts is claimed to make it suitable for the safe control of magnesium and explosive dusts, the collection of linty and adhesive dusts from buffing operations, and the exhaust of corrosive gases. Air is cleaned by a combination of centrifugal force and



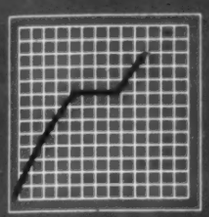
intermixing of water and dust-laden air. Air, forced through the passage of the stationary impeller, induces a sheet of water to move along the surface of the impeller blades, creating a water curtain in the form of a reverse "S" through which the air must penetrate. High-collection efficiency is claimed as a result of the impingement of dust in water, because of the centrifugal action in the impeller, and the scrubbing action of the water curtain, which permits returning the clean air to the workroom. Roto-Clone is manufactured in three classes and thirteen sizes for the exhaust of air volumes from 1000 to 25,000 c.f.m. American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.

Acid-Resistant Hood

Hood reported to give chemical workers protection against concentrations of nitric, sulphuric, hydrochloric, acetic, hydrofluoric, and carbolic acids, without deteriorating itself, has been announced. Has clear window that provides normal vision and is said to be equally acid-resistant. Made of Asco Acitex, hood covers head, shoulders, chest, and back, tying snugly at the waist. Airfeed unit as well as splash-proof



1/10 TO 100 HORSEPOWER
Five types of gearhead motors have reduction ratios ranging up to 432:1.



HIGH EFFICIENCY
More efficient than other types of slow speed drives . . . only 3% power loss in each stage of reduction. In parallel shaft type.

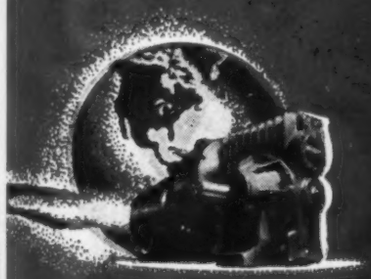
MASTER GEARHEAD MOTORS

These are the ***good reasons why*** gearhead motors met with such immediate success when The Master Electric Company originated and pioneered the first line of gearhead motors, years ago.

These are the ***good reasons why*** more gearhead motors in use today carry the Master name than all other makes . . . COMBINED.

These are the ***good reasons why*** Master Gearhead Motors will help you save money and still add greatly to the convenience, compactness and safety of your motor driven machinery. For best results, use them for either your plant or your products.

THE MASTER ELECTRIC COMPANY ● DAYTON 1, OHIO



PROVEN RELIABILITY
Their durability and stamina have been proven with millions of hours of service all over the world.

UNDIVIDED RESPONSIBILITY
The complete Gearhead Motor is designed and built by one manufacturer in one plant.

COMPACT
Integral, compact design saves space, saves money, improves appearance.

MATHEWS *Flexible* WHEEL CONVEYER

THESE sections of Wheel Conveyer with Universal Couplings and quickly adjustable Tripod Supports are ideal for handling cartons, cases, and miscellaneous light packages. The sections are available in 5′ and 10′ lengths, and with 8, 10 or 12 wheels per foot. The standard section width is 12″ overall. 45° and 90° Curves with adjustable guard are standard. The wheel used is a high-quality skate wheel, the result of 40 years of Mathews experience in conveyer bearing and wheel manufacture. Prices and complete information sent on request.

MATHEWS CONVEYER COMPANY
Ellwood City, Pa.
WEST COAST • MAILLER SEARLES, INC., SAN FRANCISCO
CANADA • MATHEWS CONVEYER CO., LTD., PORT HOPE, ONT.
ENGINEERING OFFICES OR SALES AGENCIES IN PRINCIPAL CITIES

side vents for better air circulation, built-in headgear, and light but durable fiber frame supporting the window adding to wearing comfort, are other features. Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12.

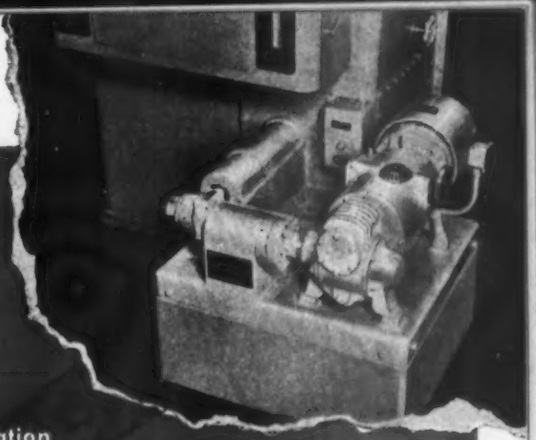
Portable Infra-Red Unit

Three types of infra-red lamps are announced for baking, drying, preheating, and dehydrating operations. Model 60-000 is a hand model; 60-200 is equipped with a clamp base, and may be mounted either singly or in multiple pairs to wood or metal

framework; and 60-100 is mounted on a portable stand. A 20-gage black metal panel, 1½ inch in diameter, can be heated in excess of 800 deg. F. in 1½ minutes, with any of the models, when the edge of the reflector is spaced 2½ inches from the metal. The Fostoria Pressed Steel Corp., Fostoria, Ohio.

Direct-Connect Coupling

Direct connect coupling is announced for use in all types of testing operations. The coupling fits over end of any standard type and 10056 nipple, the "dogs" of the coupling gripping securely in the undercut



Stepless VARIABLE SPEED operation

offers tremendous advantages on many applications. You, yourself, probably have several applications on which variable speed operation would improve the quality of the product and increase the quantity of production as well.

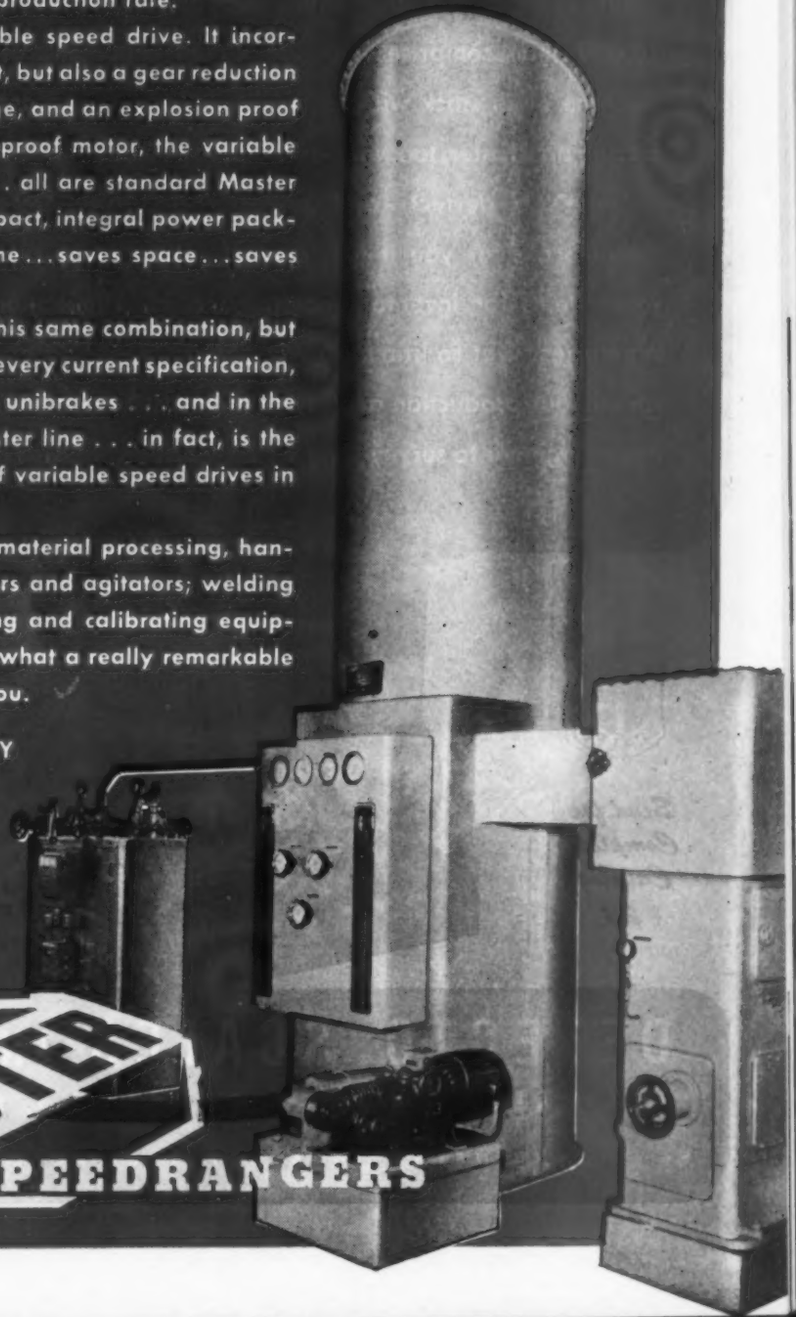
For example, look at this oxygen generator which produces from ordinary air, absolutely dry oxygen that is at least 99.5% pure. This Speedranger provides stepless variable speeds so that pure oxygen and only pure oxygen is pumped off. Provides a high uniform quality product at peak production rate.

But look more closely at this variable speed drive. It incorporates not only the variable speed unit, but also a gear reduction to give speeds in exactly the right range, and an explosion proof motor. All of these . . . the explosion proof motor, the variable speed unit, and the gear reduction . . . all are standard Master units that easily combine into one compact, integral power package. Saves ordering and mounting time . . . saves space . . . saves money.

Probably you will not need exactly this same combination, but Master Speedrangers are available for every current specification, every type enclosure, with gearheads, unibrakes . . . and in the whole wide range of types in the Master line . . . in fact, is the most flexible, the most versatile line of variable speed drives in the world.

The next time you need a drive for material processing, handling, and conveying equipment; mixers and agitators; welding positioners; machine tool drives; testing and calibrating equipment . . . to name only a few . . . see what a really remarkable job Master Speedrangers can do for you.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO



MASTER SPEEDRANGERS

Detecto Industrial Scales that Save hours and handling

For counting unknown quantities or checking pre-determined quantities.

Count watch dials or screws or anything else with perfect accuracy—get the same count each time whether 10 or 10,000 items comprise your unit. Count your items at the machine or in stock without removing them from containers and do it faster, too, with less handling—fewer man hours.

There's a perfect—and perfectly accurate—Detecto-Gram Scale for you if it is part of your factory plan to count items for inventory control and for elimination of shortages. Get to know how Detecto-Gram Scales can speed your production and lower your costs. Ask a Detecto Scale Engineer to survey your weighing operations.

A 10:1 and 50:1 ratio scale for accurately handling small, lightweight pieces.

DETECTO SCALES

Send for Complete Catalog #24

DETECTO SCALES INC.

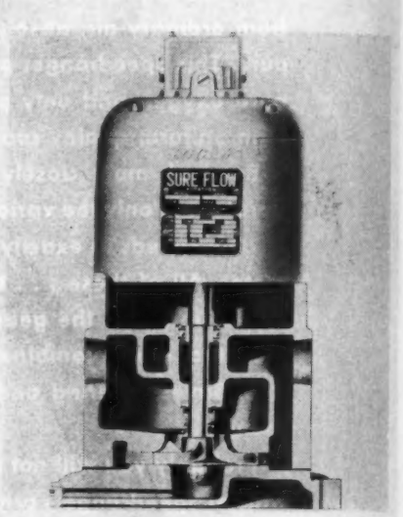
ONE MAIN STREET BROOKLYN 1, N. Y.

SCALE ENGINEERS IN ALL PRINCIPAL CITIES

just behind the threads of the nipple. Connecting fluid or air line with the coupling takes only a second and is claimed to save up to 80 percent in time and labor. Coupling is made of durable, lightweight aluminum, and comes in sizes of ¼, 5/16, ⅜, ½, ⅝, and ¾ inch. E. B. Wiggins Oil Tool Co., Inc., 3424 East Olympic Blvd., Los Angeles 23.

Centrifugal Pumps

Line of centrifugal pumps, for pumping coolants and cutting oils, is claimed to be adaptable for circulating cooling liquids, pumping or circulating water, as well as for quenching oil and general liquid transfer service. Twenty-seven different types and sizes include foot-mounted, bracket-mounted, flange-mounted, grinder, and



submerged pumps. Open impeller is said to eliminate the need for close clearances or metal-to-metal contact of running parts, and to allow pumping of liquids containing some abrasives, filings, and other foreign matter without damage to the pump. Equipped with integral motor drive to allow latitude in locating the pump, since no gears, chains, or other forms of mechanical drive are necessary. Logansport Machine Co., Inc., Logansport, Ind.

Relief Valve

Pop relief valve, said to have high coefficient of lift for the disk, is announced. High lift is secured through the design of the valve disk, by which the velocity of the fluid is trapped and its kinetic force is converted into additional lift. Type 1800 valve, for pressures up to 300 pounds, can be used on steam, air, gas, water, and other liquid process lines. Made in ½- to 2½-in. sizes, and meets ASME specifications. The valve is built with an adjustable single blow-down ring permitting regulation of pressure. Has long carbon-steel springs. Also available with hand wheel for easy and accurate pop adjustments on jobs requiring frequent changes of operating pressures, or with packed adjusting bolt under a protecting cap for gas service. Type

LO-HED

1/4 TON ELECTRIC HOIST

• lifts more pounds per day!

HERE'S A ¼-ton electric hoist that lifts its full rated capacity day after day, month after month in heavy duty, mass production use. Built to big hoist standards, it maintains its lifting ability when the going is tough, handling more pounds per day than ordinary hoists of its capacity.

Every inch a quality hoist, Lo-Hed's heavy duty construction means smoother, steadier performance. Its heavy duty, high starting torque motor speeds up quickly and carries repeated peak loads safely. Sturdy spur type gearing with ball bearings. Automatic lowering and electric motor brakes. Heavy duty push button station. Steel pull cable. Shock-proof trolley. Streamlined, dust-proof design. Pressed steel chassis.

You can expect from these and many more features the same long life and low cost operation found in the larger, famous Lo-Heds. See how easily production is kept on the line with a ¼-ton Lo-Hed "on the beam"! Write for descriptive folder today.

Weight: 195 lbs., bolt suspension type; 225 lbs., plain trolley type.

The ¼-ton Lo-Hed is offered with or without a trolley

Copyright 1945, American Engineering Co.

OTHER Æ PRODUCTS: Æ-TAYLOR AND PERFECT SPREAD STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER, DIAMOND FACE GRINDERS

LO-HED ELECTRIC HOIST

There's a Balanced Lo-Hed Electric Hoist up to 12 tons capacity for every purpose, adaptable for operation on any monorail system.

AMERICAN ENGINEERING COMPANY

2426 ARAMINGO AVENUE, PHILADELPHIA 25, PA.

SEE YOUR CLASSIFIED PHONE DIRECTORY UNDER "Æ LO-HED HOISTS" FOR YOUR NEAREST REPRESENTATIVE

NATION WIDE

AIR FILTER SERVICE

Typical Air-Maze Panel for heavy-duty service.

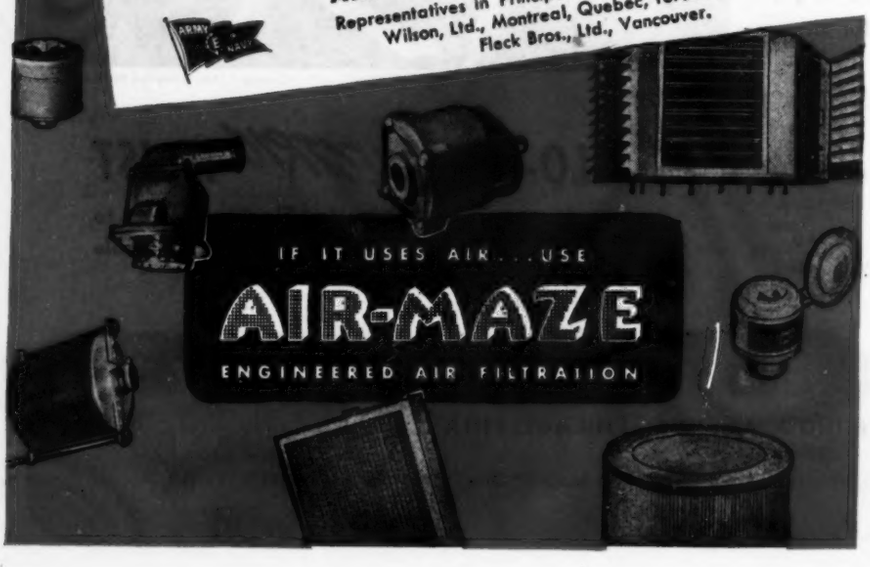
Dotting the nation from border to border and coast to coast are Air-Maze factory representatives. They are competent air filtration engineers trained, experienced, and ready to assist you with your air filtration problems.

Take advantage of this Air-Maze service because Air-Maze has specialized in engineered, precision-built air filters for twenty years. So, whether your interest applies to air conditioning, ventilating, compressors, blowers or engines, you can have *engineered air filtration* in every Air-Maze filter.

Air-Maze air filters are constructed of metal throughout. They are easily washable—last indefinitely. For further data on types and application send for catalog AGC-144. And remember—"If it uses air, use AIR-MAZE".

AIR-MAZE CORP. • CLEVELAND 5, O.

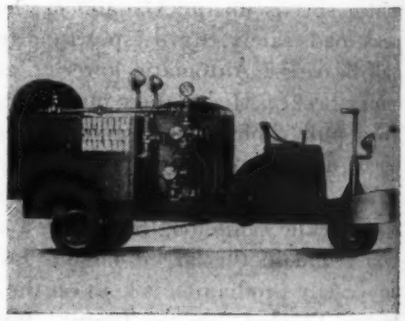
Representatives in Principal Cities. In Canada: Williams & Wilson, Ltd., Montreal, Quebec, Toronto, Windsor; Fleck Bros., Ltd., Vancouver.



1840 is somewhat smaller, and has a predetermined orifice instead of the adjustable blow-down ring. Farris Engineering Co., 345 Commercial Ave., Palisades Park, N. J.

Mobile Fire Extinguisher

Traveling down narrow aisles and claimed to be able to reach ordinarily inaccessible fires in seconds, mobile fire fighter supplements outside help. Model FF Chore Boy gasoline-powered truck has 1-ton capacity, 79-in. wheel base, dual rear wheels, deck space approximately 20 square feet, and speed up to 15 m.p.h. Advantages claimed for the fire fighter are maneuverability,



self-contained supplies, and that its operation can be taught quickly to almost any worker. With its own water supply tank at 120 g.p.m. and 200 feet of hose, extinguisher can smother flames before they become conflagratory. Fire hose of 1½ inches can be connected to a hydrant while its own water supply is being used. Combination fog or straight-stream nozzle. Steering mechanism is simple hand control. The Buda Co., Harvey, Ill.

Elevating Ladder Tower

Multi-purpose ladder tower can be elevated and extended by a single hand-operated winch, self-locking at any extended height, according to the manufacturer. Tower has 360-deg. turning radius, for manual or

It's the Handy Little Stewart-Warner Portable Hand Tachometer #757-W

IT'S SMALL, but it's rugged. It's accurate to the single revolution because it's precision-made. In a matter of seconds you can get a reading on machine speeds, whether shafts or pulleys revolve clockwise or counter-clockwise.

In all, it's a mighty handy "checker-upper" for production engineers, maintenance superintendents, foremen, shop mechanics and service men.

Today, control of machine speeds is mighty important. Quotas are heavy, schedules are speeded up, whole production line speeds must synchronize and equipment must be *made* to last. With the Stewart-Warner Portable Hand Tachometer you can *check*—and make *sure* you are getting the best performance from your machines.

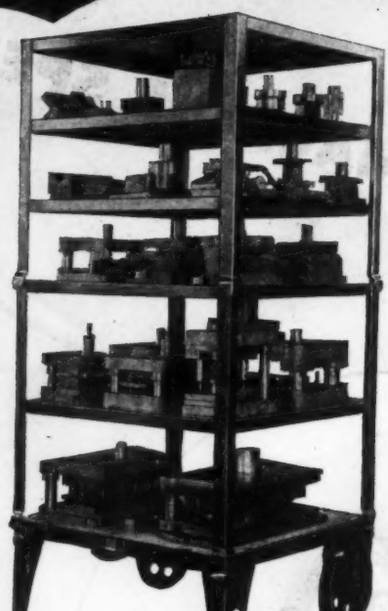
The tachometer is easy to use and light in weight, yet it can help you make your plant more efficient. The instrument requires no attention and registers speeds from 100 to 4000 R.P.M. Why not get several Stewart-Warner Portable Hand Tachometers for your plant? Write for complete details, today. There's no obligation.

• Stewart-Warner Portable Hand Tachometers come ready to use, packed in a carton that can be retained and used as a case for the instrument. Included are two tips—(No. 1) for shafts having a center hole—(No. 2) for measuring speed of flat shafts, pulley, etc. Price only $9.50 each.

STEWART-WARNER
Industrial Tachometers

Stewart-Warner Corporation
1870 Diversey Parkway, Chicago 14, Ill.

NEW ...



INTERLOCKING DIE RACKS

with heavy gauge shelves provide

BETTER HANDLING

BETTER PROTECTION

BETTER STORAGE

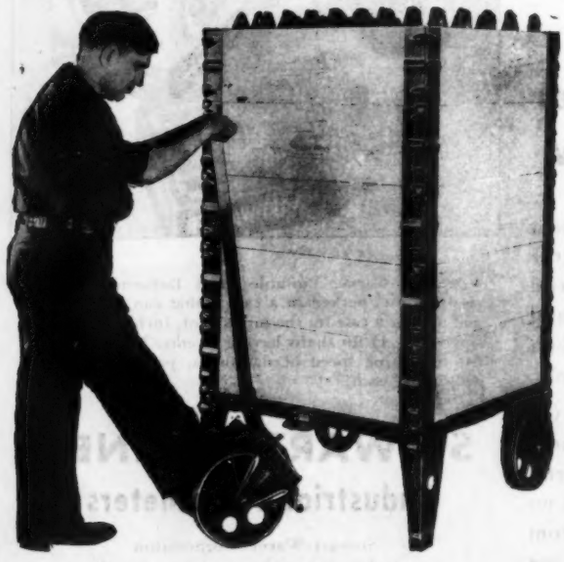
of Valuable Dies —

another added feature of the

TURNER SYSTEM OF MATERIALS HANDLING

Dies cost money. Proper care and handling of dies is a "must" in the well organized plant. There is no better way of taking care of them than that provided by the new Die Racks in the Turner System of Materials Handling. These racks interlock one on top another for vertical expansion. They fit on the Transport which may be quickly moved (by hand Jimmy or power equipment) to any part of the shop.

Dies are always visible and easily accessible. Illustration above shows heavier dies on lower two-shelf racks and lighter dies on upper three-shelf rack. Shelves are No. 12 gauge steel.



Portable Bin Sections build or reduce vertical extension as needed.

Part of the Turner System

These Die Racks are units of the complete Turner System of Materials Handling which speeds production, cuts costs, reduces accidents and saves time, labor and space. All units are designed to fit on the semi-live Transport. Removable Bin Sections, Trays and Racks allow vertical expansion to any practical height.

Send for Descriptive Book

All of these units are illustrated and described in a twenty-page book covering the entire system. Write for it on your letterhead.

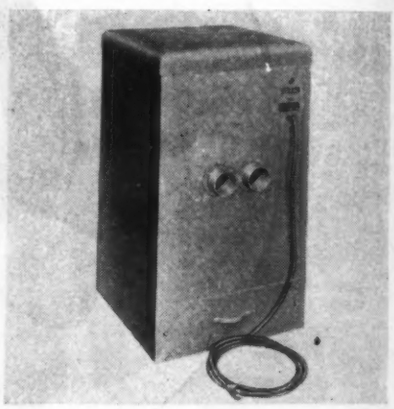
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

automatic operation, and variable inclination for 45 to 75 degrees. May be mounted on truck, trailer, or other vehicle. Is made in three strongly trussed sections locked in place by continuous steel guides operating on sleeve-type bronze roller bearings. Standard type opens to 35-ft., 2-in. maximum working height at 75-deg. angle, with a minimum working height of 22-ft., 8-in. at 45-deg. angle. The unit fully extended is 38 feet Folding 24x30-in. work platform at top of the ladder tower has adjustable tubular guard rail and trapdoor to platform. Universal Fittings & Scaffolding Co., Belienople, Pa.

Dust Collector

Standard attachments simplify installation of unit type dust collector on grinders, buffers, sanders, polishers, lathes, and other machines. Compact in size, it fits behind or beside machines. Five hundred cubic feet per minute is said to be developed through the two inlets by a ¾-hp., 3450-r.p.m. motor, driving a 7½-in. diameter by



2-in. wide squirrel cage blower wheel. The two 3-in. diameter inlets can serve either one or two machines. Filter consists of 20 layers of viscous coated filter paper. Peeling off the first two layers restores filter's efficiency when clogged with dirt. Dimensions are 20x20x38 inches, shipping weight is 265 pounds. Ideal Commutator Dresser Co., 1416 Park Ave., Sycamore, Ill.

Control Timer

Reco control timer with a synchronous motor is for controlling operations where starting is initiated by pushbutton, and stopping is automatic at a pre-set time. Timer can also be equipped with interlocking controls so that each operation must be completed in correct sequence before the next is started. Failure at any point would post a signal, and timer would re-cycle automatically to starting position. Can be applied as hydraulic press control in which pressure valves are shut off on reaching a certain tonnage, holding the pressure for pre-determined time, and signaling the operator. Equipped with silver contacts, and has two-circuit control. Has synchronous motor for operating on

IN 8 MINUTES
Transfax Reproduces Drawings DIRECTLY ON METAL!

1. Prime

2. Spray

3. Print

4. Hose

5. Spray . . . and Fabricate!

How New Kodak Transfax Process Can Make Such Surprising Savings

TRANSFERRING drawings to metal by the new Kodak Transfax Process is remarkably simple and quick. And Transfax reproductions are line-for-line . . . dimension-for-dimension. Every detail is shown with unvarying accuracy, regardless of the size of the part to be fabricated.

You buy no special equipment. The entire process can be handled in ordinary room light—by anyone . . . without lengthy training of operators. Step by step . . .

1—Using an ordinary spray gun you coat any nonporous sheet material—metal, plastic, rubber—with Kodak Transfax Primer.

2—Now, apply the quick-drying Kodak Transfax Spray.

3—Place the original drawing in contact with the coated metal . . . expose briefly to arc or mercury vapor illumination.

4—Pour on a weak ammonia solution . . . hose with warm tap water . . . and your drawing is on metal!

5—Spray on a thin overcoat of Primer and your reproduction is ready to stand a lot of rough handling.

Kodak Transfax Process withstands bending, shearing, punching—even the cutting torch.

Efficient, economical, and fast, the Kodak Transfax Process speeds sheet metal fabrication in many ways . . . where layouts are complex . . . where detailed instructions must go on the metal . . . where reproductions are needed in quantity. For full information write: Eastman Kodak Company, Rochester 4, N. Y.

Simple or Complex . . . It's all one to the Transfax Process. Layouts as relatively simple as this or far more complicated are reproduced with equal ease and accuracy. Another plus factor of the Transfax Process is that drawings can be positioned so that several small parts on different drawings can be laid out on a single sheet . . . speeding production, reducing scrap loss.

Blueprint on Metal: The advantages of a Transfax layout carry right through production. The worker in the shop doesn't have to refer to blueprints . . . take time to interpret, calculate dimensions. Forming lines, bend radii, drill-hole sizes and locations, part numbers—everything in the original drawing is reproduced on the metal.

Line-for-line Accuracy: With manual drafting eliminated, copying errors and time-consuming checking and rechecking of details are out . . . with Transfax, each line, dimension, note on the original drawing is printed directly on the metal without chance for error.

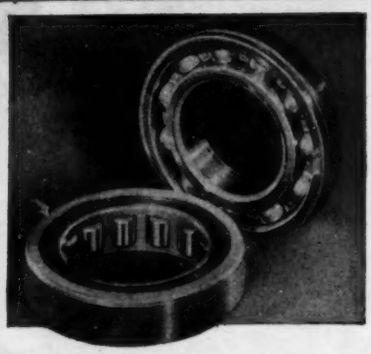
KODAK TRANSFAX PROCESS

SAVES TIME . . . ENDS ERROR . . . SPEEDS PRODUCTION

THE KODAK LINAGRAPH TRANSFER PROCESS is another Kodak development for the reproduction of working drawings on metal or other sheet materials. In this process, the metal, plastic, or plywood sheet is sensitized by lamination with Kodak Linagraph Transfer Paper . . . drawings are reproduced with photographic speed and accuracy by contact or projection. If the contact method is used, the line-for-line duplicate of the layout is always identical in size with the original. The projection method permits variation in scale . . . especially valuable when shrink templates or experimental models are needed. Whichever method is used, the reproduction is photographically accurate, and photographically complete, to even the most minute detail.

Kodak

BALL BEARING LUBRIPLATE



FOR ALL TYPES OF ANTI-FRICTION BEARINGS

BALL BEARING LUBRIPLATE is a single grease type lubricant developed for general use on roller, ball and plain sleeve bearings operating at speeds up to 5000 RPM and at temperatures up to 300° F. Its performance is outstanding. BALL BEARING LUBRIPLATE not only does a better lubrication job, but it definitely gives protection against the arch enemy of bearings . . . corrosion. Increase the life of your bearings with LUBRIPLATE.

LUBRIPLATE

Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE

Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

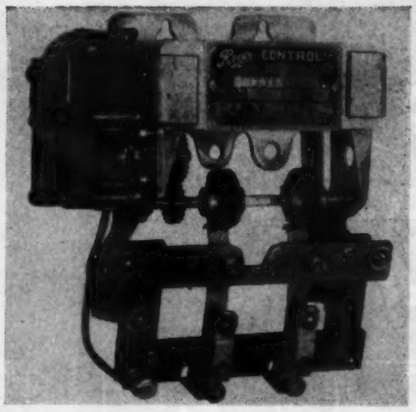
Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.

Write for a booklet, "The LUBRIPLATE Film", written especially for your industry.

LUBRIPLATE

FISKE BROTHERS REFINING CO.

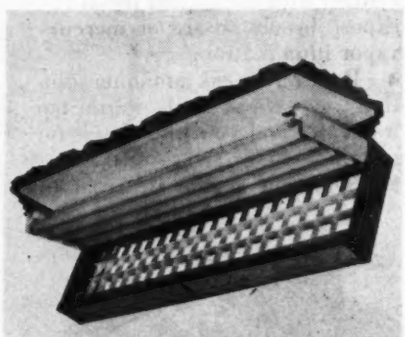
NEWARK 5, N. J.
TOLEDO 8, OHIO



115-volt, 60-cycle a.c. Can be equipped with additional circuits and arranged for other current specifications. Reynolds Electric Co., 2650 West Congress St., Chicago 12.

Fluorescent Lighting Fixture

E-Z Servicer fixture is designed to ease maintenance. Fixture is hinged so that one man can open it for cleaning or changing tubes. No tools are required, and both hands are left free. Made in four models, including both ribbed glass glare shield and



louvered types, industrial and commercial designs with 2, 3, and 4 tubes, and starter or instant type ballast. Can be installed either in single ceiling fixture or in continuous runs. R. & W. Wiley, Inc., Dearborn and Bridge St., Buffalo 7.

Building Maintenance Materials

Synthetic material called Mastic Mix is said to do away with necessity for using concrete mixers in the installation, as well as the resurfacing, of floors. Manufacturer states that a surface of Mastic Mix will not chip, is noiseless, resilient, fireproof, and skidproof, will not soften under heat, acids, or heavy traffic, is self-welding, and can be applied by anyone. A second material, a rubber-like synthetic plastic mastic for roofs is also announced. Even if roof buckles the material will conform to the new shape and effect ample protection

LUBRIPLATE No. 205

MAKE ONE BEARING OUTLIVE TWO

LUBRIPLATE No. 205 is a lubricant developed for use in grease type anti-friction bearings operating at speeds from 5000 RPM to 20,000 RPM. Users of high speed machinery tell us that this remarkable lubricant often more than doubles the life of bearings. For the lubrication of anti-friction bearings with oil type housings LUBRIPLATE No. 1 or No. 2 is recommended depending upon the operating speed.

℞ FOR YOUR MACHINERY

No. 3—Ideal for general oil type lubrication. Ring oiled bearings, wick feeds, sight feeds and bottle oilers.

No. 8—Because of its high film strength and long life reflects outstanding performance in most types of enclosed gears (speed reducers).

No. 107—One of the most popular grease type products for general application by pressure gun or cups.

No. 70—For a wide range of grease applications, especially at temperatures above 200 degrees F.

No. 130-AA—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING—This is the LUBRIPLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

Write for a booklet, "The LUBRIPLATE Film", written especially for your industry.

LUBRIPLATE

FISKE BROTHERS REFINING CO.

NEWARK 5, N. J.
TOLEDO 8, OHIO

Glass gives you more than a protective surface... *far more!*

That glass desk top you've learned to take for granted illustrates a point of importance to designers of new products, equipment or processes.

It embodies *many* characteristics of glass, in combination, to do a job no other product could do so well.

It protects the finish of the desk top, of course. But also, it provides a surface that is hard, abrasion-resistant, smooth, beautiful. Its transparency permits observation of material placed beneath it—while that material is protected from dust and moisture. The glass top has a permanent finish—one that ink or burning cigarettes won't harm. And it is quickly cleaned time and time again without injury to its lustrous finish.

These are a few of the many characteristics of glass that combine to make it an ideal surface for many of tomorrow's products or equipment. We'd like an opportunity to discuss with you the practicability of any uses of glass which may occur to you. Libbey·Owens·Ford Glass Company, 5745 Nicholas Building, Toledo 3, Ohio.

Here's the combination that makes GLASS one of the world's most versatile materials:

CHEMICALLY, the most stable of all materials, except the noble metals. Won't rot, oxidize or disintegrate, plus—

DIMENSIONALLY STABLE. Coefficient of expansion extremely low. Keeps its shape, plus—

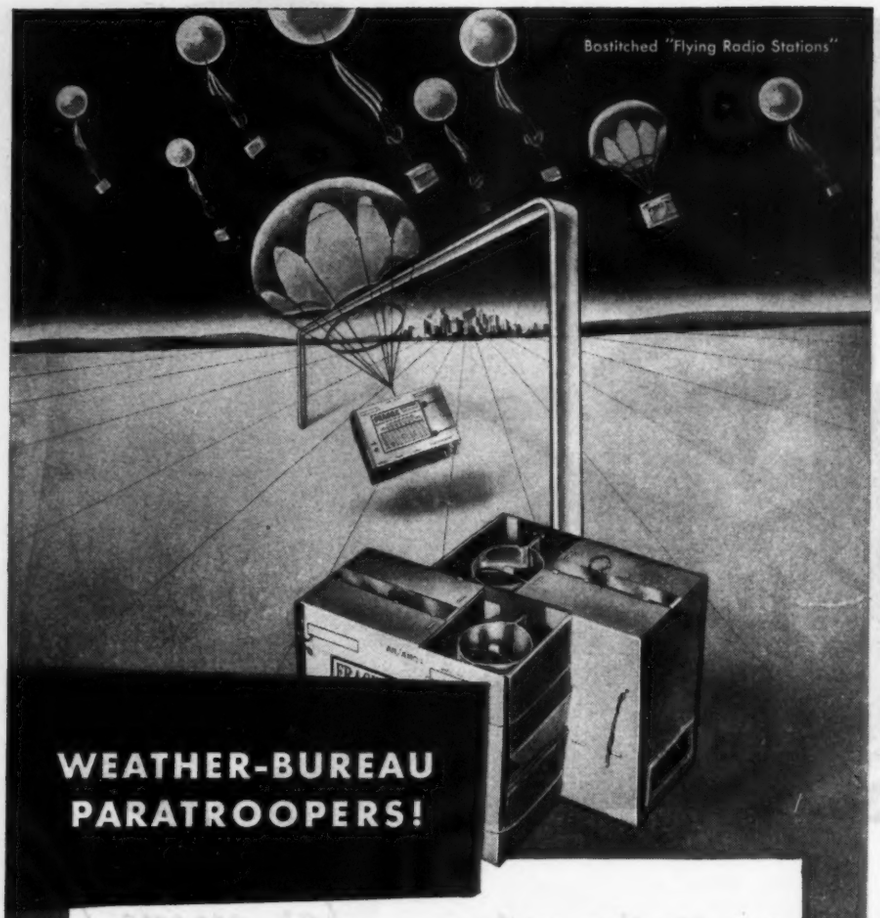
SURFACE, among the world's hardest and smoothest. Nonporous, won't absorb odors or moisture. More acid-resisting than any structural material. Unusual resistance to abrasion. Weathering qualities unequaled, plus—

STRONG, tempered glass is stronger than some metals. A square foot, ¼" thick withstands pressure of 60 lbs. per sq. in. and thermal shock of 400° F. Will not burn—

ELECTRICAL INSULATOR of outstanding strength.

L O F **LIBBEY·OWENS·FORD**
a Great Name in **GLASS**

Destructible? **Wood — Metal — Plastics — Glass. No material is indestructible. However, barring unforeseen conditions, no material will fail on a job in which it has been properly specified and engineered. When our application engineers say "Yes", you can be sure about glass.**



WEATHER-BUREAU PARATROOPERS!

If a package straight from the heavens lands in your yard . . . it will probably be a "radiosonde" . . . scientific aerial radio transmitter and recorder . . . balloon-borne many miles into the stratosphere . . . broadcasting basic weather information . . . until, its mission fulfilled, it is parachute-borne safely to earth. Complete instructions will be found on the package for its return . . . so that it may be sent aloft again and again.

BOSTITCHING plays a part in insuring the safe landing and the re-use of this modern miracle . . . an outstanding example of the Weather Bureau's engineering ingenuity and salvaging economy.

This use illustrates a simple, frequent Bostitch application. Whenever *you* think of fastening . . . metal, wood, plastics, paper, cloth, leather, rubber . . . in any combination . . . remember that in thousands of wartime and peacetime applications *BOSTITCH fastens it better and faster with wire.*

Bostitch field men the world over . . . specializing exclusively in stapling . . . backed by forty years' stapling experience . . . will be glad to discuss with you how Bostitch machines, when available, can help you get the best fastening results.

Bostitch (Boston Wire Stitcher Company) 71 Blackmore St., East Greenwich, R. I. (or Bostitch-Canada, Ltd., Montreal).

Bostitch Staples in most sizes are now available.

BOSTITCH

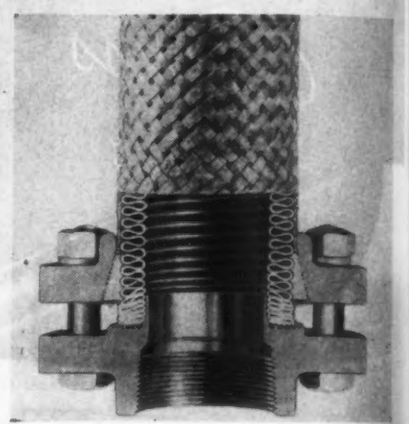
fastens it better AND FASTER *with wire*

ALL TYPES OF STAPLES APPLIED BY MACHINES
ALL TYPES OF MACHINES FOR APPLYING STAPLES

against the elements, the maker claims. A waterproofing liquid, known as Creto, is reported to waterproof any masonry with one application either to painted or unpainted surface, inside or outside, even if the brick or stucco or concrete is wet at the time of application. Certainteed Industries, 1116 Victoria Ave., Los Angeles 6.

Detachable Flange

Detachable flange for helical flexible metal hose, in sizes 2-, 2½-, and 3-in. I.D., is said to permit repeated re-use, assembly operation is simple and, with ordinary shop tools; no brazing is required. No gasket



is employed to connect the flange to the hose, making a metal-to-metal seal. Leakproof installation is also claimed by manufacturer. Packless Metal Products Corp., New Rochelle, N. Y.

Steam Tank Heater

Immersion type steam tank heater can be used with any material whose viscosity can be lowered by heating, according to the manufacturer. Heaters are claimed to speed up the emptying of tank cars and permit many viscous materials to be handled in cars not fitted with steam coils. Unit consists of a number of lengths of

For the biggest nut-turning jobs

HERE'S SUPER-POWER...

...with SAFETY!

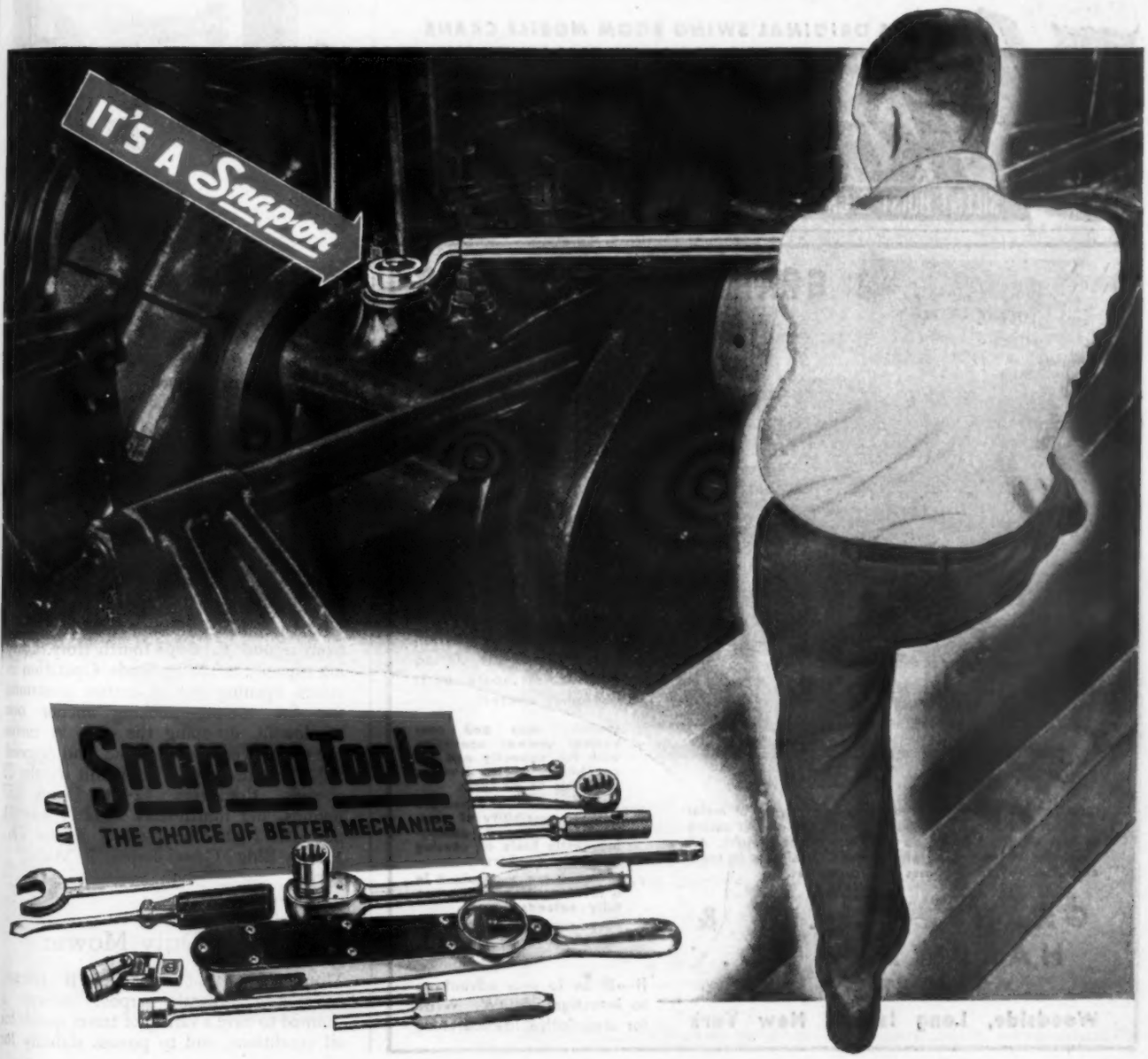
Set big nuts down *solidly*... with "beef", muscle and powerful leverage! Or break frozen ones loose instantly — there's *performance* when a Snap-on Heavy Duty Boxocket goes to work!

Performance plus *safety!* The boxocket opening completely encircles the nut . . . grips it on all sides . . . it cannot spread, jump or slip. The operator "lays into the job" with complete confidence in his own safety. And the compact offset Boxocket head reaches into cramped quarters inaccessible to other wrenches. The double hexagon broaching gives the advantage of a short turning arc where obstructions restrict free swinging of the wrench handle.

Snap-on Heavy Duty Offset Boxocket wrenches are available in a complete range of sizes from 1 1/16" to 3 1/8" opening, with interchangeable handles from 18" to 36" length. Write for 1945 catalog of 3,000 Snap-on hand and power tools for production, assembly and maintenance.

SNAP-ON TOOLS CORPORATION

8044-D 28th AVENUE KENOSHA, WISCONSIN



KRANE KAR — Swing Boom Mobile Crane

KRANE KAR transports the loads to and from the cars. You don't waste time maneuvering the vehicle . . . just operate the live boom from side to side with load on the hook. KRANE KAR reaches into the farthest recesses of the car to position or remove loads. For box, flat, or gondola cars.

USERS: Bethlehem Steel; Consolidated Steel; Columbia Steel; Pullman Standard Car Mfg. Co.; Ajax Steel & Forge; Boeing Airplane Co.; etc.

THE ORIGINAL SWING BOOM MOBILE CRANE
WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

SILENT HOIST & CRANE CO., 855 63RD ST., BROOKLYN 20, N.Y.

GRANT BALL BEARING DRAWER SLIDES

provide easy operation with protection for tools, parts and workers

Bulova Watch Company is but one of many leading industrial plants that is extending the installation of GRANT SUPREME TYPE BALL BEARING DRAWER SLIDES in tool cabinets and work benches. Modernization such as this for the storing of small tools, spare parts and supplies assures:

- ...smooth, easy and convenient drawer operation with full capacity and accessibility of drawers available at all times
- ...full extension of drawers without possibility of accidental falling out, damaging costly tools or causing injury to workers.
- ...drawers are maintained in a level position even when fully extended
- ...easy removal of drawers for cleaning or storing.

Can be installed quickly and easily in any types of metal or wood cabinets. Slides rest on bottom of drawer casing so that attaching screws do not carry drawer weight. All parts are of non-rusting plated steel. Available in types and sizes for all purposes and capacities.

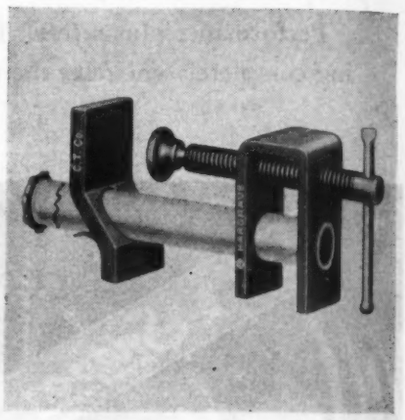
GRANT PULLEY & HARDWARE CO.
30-42 57th St.,
Woodside, Long Island, New York

It will be to your advantage to investigate NOW. Write for descriptive literature.

Fintubes connected in series, and inlet and outlet steam lines. Has low center of gravity; said to be handled safely by one man, or easily by two. Cross handles aid in positioning heater over discharge outlet in the car, in blocking heater at various depths, and removing unit after the car is empty. Two sizes—No. 642 for use with tank cars, and No. 442 for tank trucks. The Brown Fintube Co., 160 Filbert St., Elyria, Ohio.

Steel Clamp Fixture

Frame and screw of clamp fixture are of steel, while the slide of heat-treated steel is said to be slip-proof on pipe under pressure, although easily released when pressure is removed. Clamping surface is 1½x1½ inches. Screw is ½ inch in diameter, fitted



with ball tip ⅛ inch in diameter, as well as with sliding pin vise-type handle. Fixture is also used for wood gluing and metal welding. Fits ½-in. pipe in any length. Stands upright on bench or table. Cincinnati Tool Co., 4018 Montgomery Rd., Cincinnati 12.

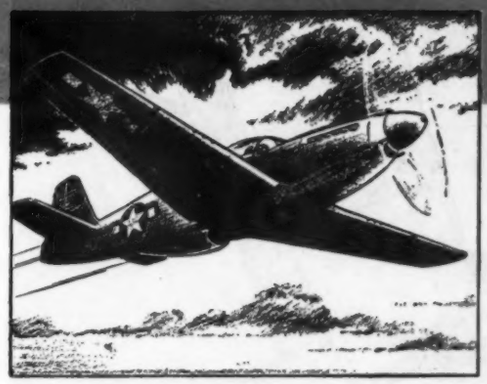
Portable Steel Fire Escape

Lightweight steel portable fire escape can be placed in safety zone away from the fire hazard by anyone. Has roomy metal yoke steps 10 inches wide by 4½ inches deep. Units are made in three lengths for use from second, third, or fourth story. Carrying capacity is 1880 pounds. Operation involves opening top of carton containing the fire escape, hooking anchor over windowsill, dropping the unit in carton out of the window to ground, and descending. Second-story (15-ft.) unit weighs 23 pounds, third-story (24-ft.) unit, 37 pounds, and fourth-story (33-ft.) unit 51 pounds. Metal-Portable-Fire Escape Co., Murray Bldg., Grand Rapids 2, Mich.

Heavy-Duty Mower

Mounted as a unit on Model "B" tractor, heavy-duty general purpose mower is claimed to have a variety of travel speeds for all conditions, and to possess stability for

MORRISON METAL STITCHING decreases sub-assembly time at NORTH AMERICAN AVIATION



We'll let North American tell it. "This new machine . . . produces a neat appearing stitch, with a tight bond between the sheets, and a high strength joint. Outstanding features . . . are lowered costs, good strength in joints, and the ability to fasten many dissimilar materials which heretofore presented problems." ● Altogether, North American finds substantial savings in labor on many sub-assemblies. By actual time study stitches are being applied many times as fast as former methods of fabricating. ● Morrison Aircraft Metal Stitchers cut, form, punch and clinch a zinc-coated steel wire stitch in 1/5 second. If you assemble metals, fabrics, woods or composition materials by any other method, it will pay you to investigate. Machines are now available.

Door to storage space for fuselage bomb sling and block assembly on B-25 Mitchell bomber.

Antenna box assembly on North American B-25 Mitchell bomber.

Cover for air duct intake for P-51 Mustang fighter.

Cover assembly for carburetor air intake on P-51 Mustang fighter.

MORRISON

PRODUCTS OF THE SEYBOLD DIVISION
HARRIS-SEYBOLD-POTTER COMPANY
DAYTON F7, OHIO

STITCHERS

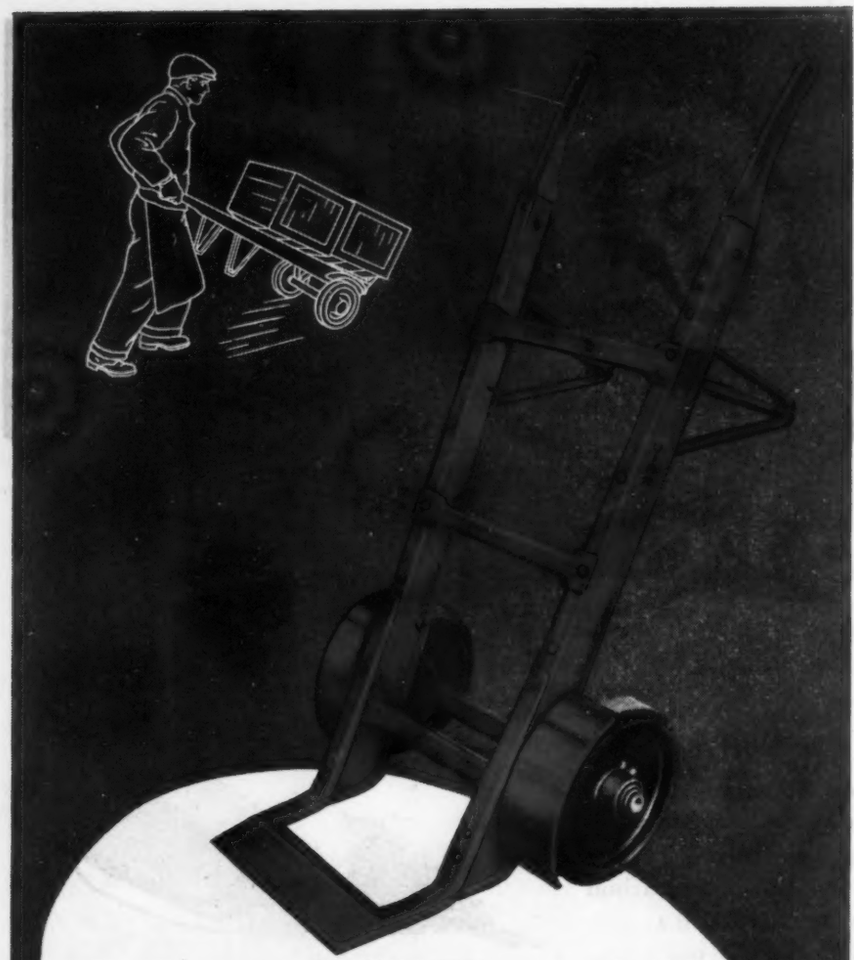
HARRIS-SEYBOLD-POTTER CO.
819 WASHINGTON ST., DAYTON F-45, OHIO

Please send me your Bulletin F-45 giving complete information on Morrison Metal Stitchers.

*Name*_____

*Address*_____

*City*_____ *State*_____



Designed and Constructed for

LOW on-the-job COST

Every one of the 39 types and 60 sizes of American two-wheel Hand Trucks has been *designed* and *constructed* for EFFICIENCY on-the-job.

"Better balance" LIGHTENS THE LOAD FOR YOUR TRUCKER—reduces fatigue—increases the tons-per-man of material moved—saves you man-hours and money!

Sturdier, PRESSED-STEEL construction makes them practically unbreakable—no time lost nor money lost for repairs.

Whether your material is packed in cases, bags or drums, there is a size and style of American Hand Truck to meet your requirements. You'll find them all in Catalog T-44. Write for it TODAY!

The American Pulley Company

4212 WISSAHICKON AVE., PHILA. 29, PA.

AMERICAN
PRESSED-STEEL
HAND TRUCKS

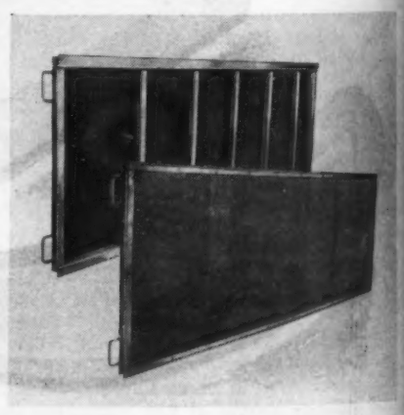
operations on extreme slopes and difficult angles. Five-foot cutter bar is easily raised and lowered by a power hydraulic lift. The inner shoe is outside the rear wheels, and can be raised a distance of 12 inches by a hand lever. Sickle delivers a full cutting stroke through wide range of positions from 45 degrees below horizontal to 60 degrees above. Belt drive slippage protects the sickle by providing a safety relief and eliminating possible damage. The mower design leaves the drawbar open, enabling tractor to pull gang-mowers or other equipment without removing cutter bar. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Diamond Grinding Wheels

Dual-purpose "Super-Cut" Zurium Bonded diamond wheel (two diamond wheels in one) for rough grinding and fine finishing of cutting tools, is announced. Outer 7-deg. beveled surface contains layers of coarse diamonds, while inner flat surface is built up of fine 400 mesh diamonds. According to the manufacturer, angling the side or point of a carbide tool, it can be rough ground, and fine finished in 6 seconds without the operator having to shift his position; no wheel change-over is required; and tools stay sharp for long periods. Industrial Abrasives, Inc., 3724 West 38th St., Chicago 32.

Stainless Steel Screen

Screen of stainless steel, for use with all types of process water, is announced. Face of screen is a fine mesh stainless steel wire



QUALITY STEEL TUBING...

Then it was for wagon axles

Oldtimers at OSTUCO will tell you that during the Spanish-American war, one of the applications of tubing was wagon axles. Today again, one of the chief needs for steel tubing is for wartime vehicles. And the demand is for steel tubing to meet specifications that reveal as great progress in tube-making as there has been in transportation. But no matter how great the change in vehicle design, quality in tubing has always been of paramount importance at OSTUCO, where it is checked at every turn as demonstrated by the tensile test illustrated on this page —wherein tube sections are ruptured under tension to make sure OSTUCO seamless meets specifications of yield strength, elongation and ultimate tensile strength.

Constant checks on quality have resulted in wartime tubing delivery which has earned such comments as, "we have come to look on your company as an essential and contributing factor in helping us meet our production schedules" from many of America's industrial leaders.

Why not contact the OSTUCO sales office nearest you for tubing engineering service and data when you start working out your new plans for competitive production. The offices listed below are ready to serve you.

★ ★ ★

CHICAGO 6, ILLINOIS	Civic Opera Bldg., 20 N. Wacker Drive
CLEVELAND 14, OHIO	1328 Citizens' Bldg.
DETROIT 2, MICHIGAN	2857 E. Grand Blvd.
HOUSTON, TEXAS	1006 Washington
LOS ANGELES, CALIF.	Suite 200-170 So. Beverly Drive, Beverly Hills, Calif.
MOLINE, ILLINOIS	225 Fifth Ave. Bldg.
MONTREAL, QUEBEC, CANADA	3735-3745 St. James St.
NEW YORK CITY 17, N. Y.	70 East 45th St.
PHILADELPHIA 9, PA.	123 S. Broad St.
SYRACUSE, N. Y.	501 Roberts Ave.
TORONTO, ONT., CANADA	77-79 Front St. E.
TULSA 3, OKLAHOMA	604 Tulsa Loan Bldg.
VANCOUVER, B. C., CANADA	1016 Mainland St.

THE OHIO SEAMLESS TUBE COMPANY

Plant and Main Office • SHELBY, OHIO

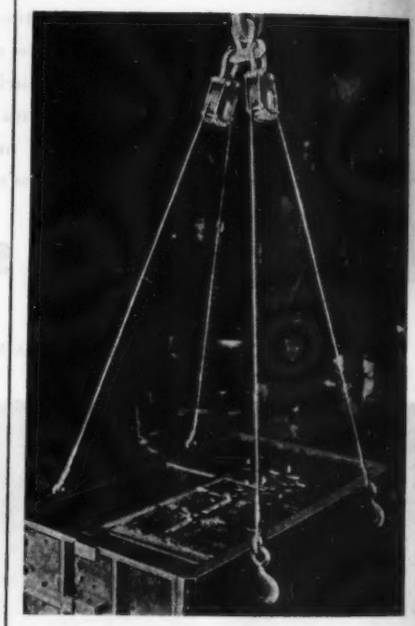
MANUFACTURERS OF SEAMLESS AND ELECTRIC-WELD STEEL TUBING

SHELBY OSTUCO OHIO

fabric backed by a heavy-gage screen of approximately 1-in. square mesh. Behind the backing are the horizontal back struts of the frame itself, said to provide maximum resistance to buckling under water pressure. The unit is light in weight and easily removed for quick cleaning. Available in any dimension, as well as with specially designed frames. Hoisting apparatus for removing frames for cleaning can also be supplied. Rodney Hunt Machine Co., Orange, Mass.

Lift Slings

Coldwell Level-Lift slings, with capacities of ¾- and 1½-ton, have been added to line of 3- and 6-ton slings. Utilized for handling unbalanced loads level and is claimed to be particularly adaptable for lifting odd-shaped materials, such as castings, long materials like pipes, bars, and long boxes



of materials. Size or capacity ⅛ of ultimate breaking strength. Two units may be used together on one crane hook to double capacity. IWRC Preformed Monarch Whyte Strand 6x37 rope is wrapped 2¼ times around floating sheave (drum) in the equalizing block, which has braking action to arrest leg adjustment when load is lifted, preventing slippage. Macwhyte Co., Kenosha, Wis.

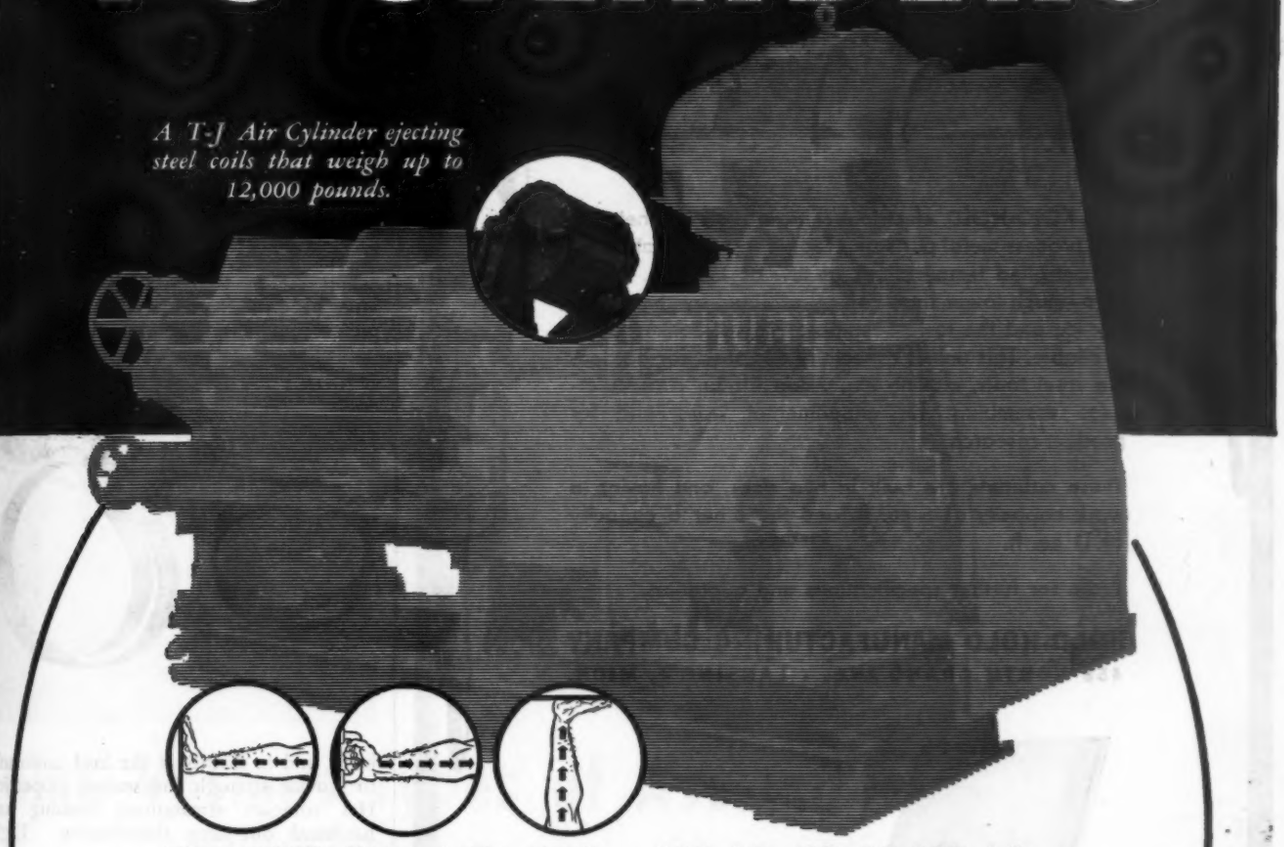
Portable Insulation Tester

Small portable insulation tester, easily carried in one hand, plugged into any 115-volt, 60-cycle outlet, is claimed to be capable of supplying smooth variable test voltages from 0 to 2500 volts. Has capacity of 750 volt-amperes and can stand 1-min. loads of 1500 volt-amperes without injury. Tester can be used for electric apparatus ranging from wiring for small appliances to diesel-electric locomotives up to 600 horsepower. Complete set, built into a small steel case, consists of a dry-

Simplify Your Machines

...SPEED PRODUCTION WITH T-J CYLINDERS

A T-J Air Cylinder ejecting steel coils that weigh up to 12,000 pounds.



FOR PUSH-PULL-LIFT JOBS...100 LB. OR 50,000 LB.

Harness T-J Cylinders to your tough jobs of power movement—to improve performance of machines and equipment!

For presses—clutches—hoists—furnace and oven doors—material handling equipment—shears—damper regulation—and scores of other jobs where pushing, pulling or lifting is needed, use T-J Air and Hydraulic Cylinders! Available in many standard sizes and styles... both cushioned and non-cushioned types. These Cylinders are T-J engineered to deliver maximum power movement in every stroke... dependably...with long life. Write for latest catalogs.
The Tomkins-Johnson Co., 603 Mechanic Street, Jackson, Michigan.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

150°
BELOW ZERO

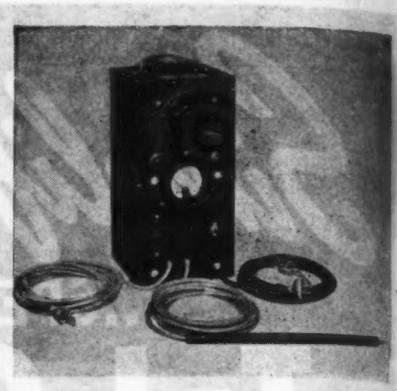
In a KOLD-HOLD electrical refrigeration cabinet you can process metal parts and tools consistently at closely controlled temperatures as low as 150 deg. below zero—much lower than can be attained by the use of dry ice and the lowest temperature yet commercially available. This unit is especially designed for hardening steel tools, making expansion fits on close tolerance assemblies, for experimental work, and for product research.

These cabinets are built in two sizes, one having a work capacity of 5 cu. ft. and the other a capacity of 11 cu. ft.

Write for further specifications and quotation.

KOLD-HOLD MANUFACTURING COMPANY
456 NORTH GRAND AVE. • LANSING 4, MICH.

KOLD-HOLD



type, step-up transformer, variable autotransformer for voltage control, indicating voltmeter, air circuit breaker with instantaneous overload trip, and control switches. Two 15-ft. shielded test cables and a 15-ft. supply cord are included. General Electric Co., Schenectady, N. Y.

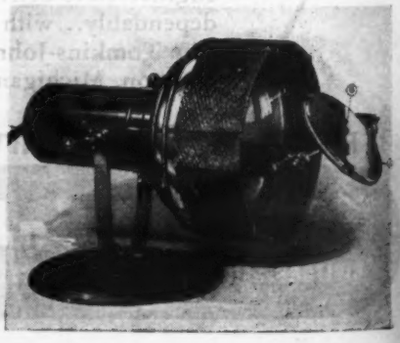
Hose Clamp

Worm drive hose clamp, made to Specification AN-FF-C-406-A, incorporates an inner band of stainless steel that is said to protect hose from serrations in the outer

band, and to distribute the load uniformly to provide strength and sealing properties. Has compact streamlined housing and hardened one-piece thumbscrew. Eight adjustable sizes to cover range of applications. Wittek Manufacturing Co., Chicago 23.

Inspection Lamp

The inspection of shells, cavities, castings, tubes, and other objects with deep openings, for burrs, grease, and defects, is



FROM SIMPLE BASIC APPLICATIONS...

MOVEMENT
THERMOSTATIC MOTOR
This type of assembly is widely used in temperature regulators, or similar units, where a thermostatic charge is confined in the bellows and where a valve, switch or damper is to be operated in response to temperature changes.

Come Various Types of Assemblies

It would be difficult to think of a control device as simple as a bellows, or one as effective and efficient.

Temperatures and pressures are translated into direct motor action; expansion is absorbed; motion is transmitted; rotating shafts sealed, all by means of bellows and bellows assemblies. In fact, correctly designed and engineered bellows offer simple solutions to many seemingly complicated problems.

Bridgeport Bellows are unit-constructed, with no seams or solder. They are built to serve indefinitely.

Whatever your problem—if it conceivably concerns bellows, we would like to discuss it with you. Our engineering department is at your service; our manufacturing facilities, complete and ready to meet your schedules.

Write for new catalog GF-100.

Bellows Assemblies . . . Bellows . . . Bellows Devices

BRIDGEPORT THERMO

LINK-BELT SPEEDER CARGOCRANE

Works Freely in TIGHT CORNERS

Mobility, Maneuverability, Power and Speed—
Four words that mean all they say when applied
to the Link-Belt Speeder Cargocrane!
You run it into a narrow space, snatch up a
load and you're on your way, but quick!
Loading, stacking, handling materials, even
assembly and erecting jobs are done fast and
smoothly with the Cargocrane.

Get the full particulars. . . . Ask for Bulletin 2033.

9031

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
A DIVISION OF LINK-BELT COMPANY

claimed to be made easy with No. 7500 inside inspection lamp. The inside of the article being inspected is brought out clearly in the adjustable mirror, making it unnecessary for the inspector to squint or strain. A strong light is thrown inside the cavity where needed, and the operator adjusts mirror and completes the inspection. Lamp has 100-watt, 120-volt rating, and comes complete with a No. R-40-Spotlight installed, an adjustable mirror, a 12-ft. insulated cord and plug, and adjustable wingnuts to allow for tilting light, as well as for mirror adjustment. Unit is ready to plug in any light socket for immediate use. McGill Manufacturing Co. Inc., Valparaiso, Ind.

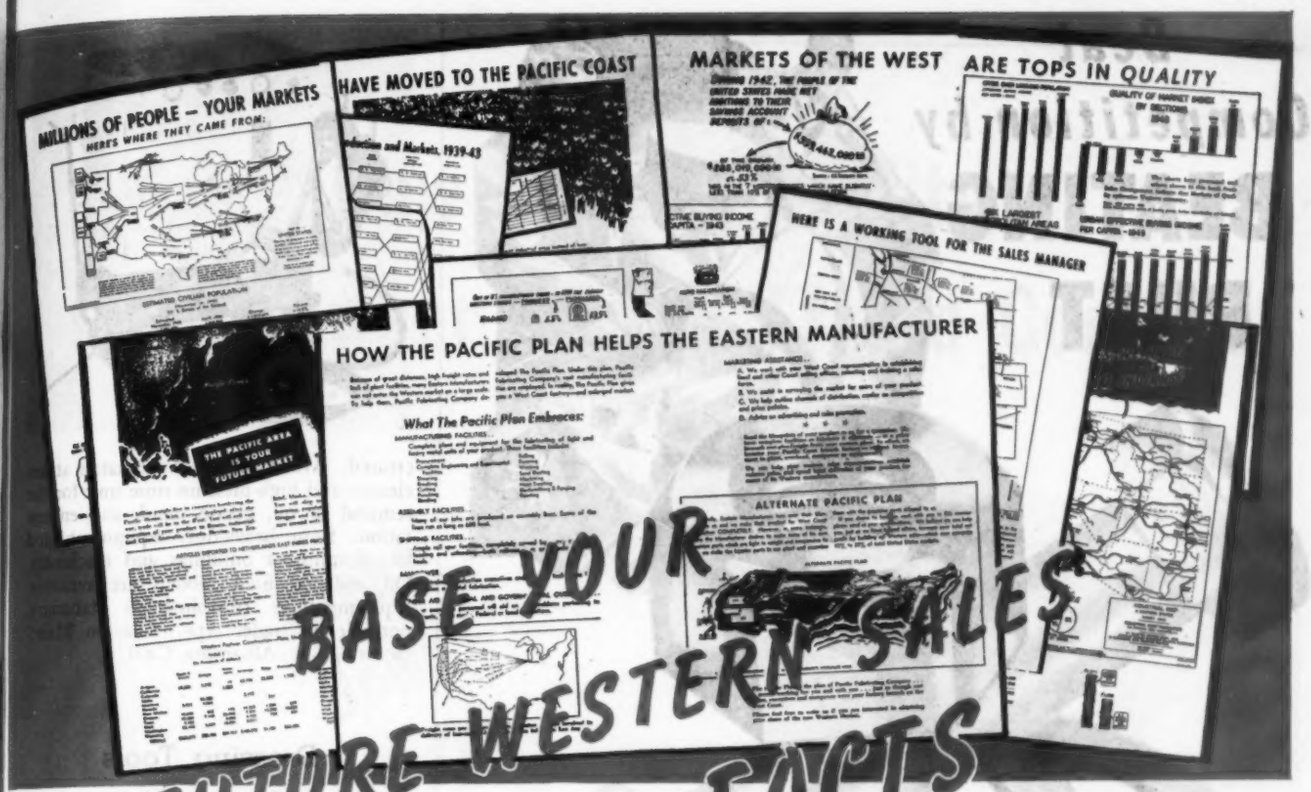
Wall Shelf Stand

Wall shelf stand made from seamless aluminum tubing of special alloy, with shelves of polished stainless steel clad, is announced for use in plant hospitals. Frame is welded and polished so that all joints are rounded, with no corners, for easy cleaning. Lacquer finish is claimed to

make stand resistant to antiseptics, chipping, cracking, or turning dark. It is lightweight; corrosion-resistant glides make it easy to move as well as providing electrical grounding. All shelves are removable and are provided with a narrow rail to prevent instruments from falling. Over-all height, 68 inches; length 48, upper shelves 10x8 inches; lower shelves, 15x48. Aircraft Specialties Co., 601 South Anderson St., Los Angeles 23.

Steam Cleaner

Models A and AR Kerrick Kleaners are announced. Units feature inverted burner mounted over the coil, and operating on the down-draft principle, placing the burner and all control mechanisms at working height for quick and easy inspection and service. Soot and carbon deposits are removed by flushing with the vaporized solution from the cleaning gun, without shutting down or dismantling cleaner. Thermal efficiency is said to have been in-


MILLIONS OF PEOPLE — YOUR MARKETS
HERE'S WHERE THEY CAME FROM:
HAVE MOVED TO THE PACIFIC COAST
MARKETS OF THE WEST
ARE TOPS IN QUALITY
HERE IS A WORKING TOOL FOR THE SALES MANAGER
HOW THE PACIFIC PLAN HELPS THE EASTERN MANUFACTURER
What The Pacific Plan Embraces:
ALTERNATE PACIFIC PLAN
THE PACIFIC AREA IS YOUR FUTURE MARKET

BASE YOUR FUTURE WESTERN SALES ON THESE FACTS

EASTERN MANUFACTURERS are *today* revising their future marketing plans. Millions of their customers have moved to the new, industrialized West—America's third largest market.

Prior to the war, the West imported the bulk of its consumer and producer goods from the East. But *after the War,* because it now has the equipment and know-how, the West will produce a large share of the goods consumed, locally.

If you are an Eastern manufacturer, you will be at a disadvantage because of freight rates and slower delivery service. If you wish to retain your Western market or acquire a new foothold here you can do so by employing the facilities of Pacific Fabricating Company to make your product *in the West.* In effect, we become your Pacific Coast branch factory—without investment in plant, overhead, manpower or equipment.

Send the blueprints of your product to us for quotation. Your Western market will reflect its importance on your future balance sheet.

"THE PACIFIC PLAN" GIVES YOU THESE FACTS

Write or wire for your complimentary copy *today.* You receive a complete Western market survey worth thousands of dollars to you. This 36-page statistical booklet will open your eyes to Pacific Coast market possibilities for your product. When you write, tell us what you make so we can send you added, pertinent market data.

Pacific
FABRICATING COMPANY
D. C. Hammond, President
3383 EAST GAGE AVENUE
HUNTINGTON PARK, CALIFORNIA

FABRICATORS IN METAL • DESIGNERS ENGINEERS

Beat Competition by BEATING RUST

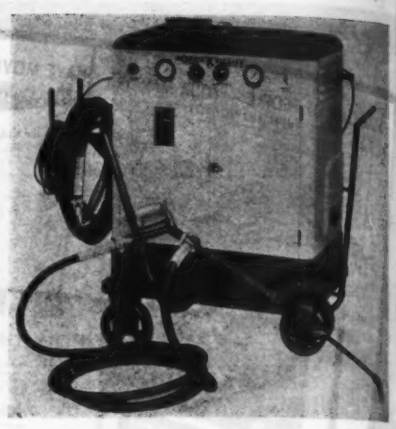
Plan your product to be a winner . . . . in the face of keen future competition . . . . by using Harper Everlasting Fastenings—the fastenings that (1) resist rust and corrosion, (2) stand up in the presence of many acids, alkalies and other tough conditions, (3) add years of service life AT LOW COST, (4) can be removed with ordinary tools and used again and again. Every Harper fastening is made of either brass, copper, naval bronze, silicon bronze; Monel or stainless steel (nothing in common steel).

4360 ITEMS IN STOCK

Harper is known as "Headquarters for Non-Ferrous and Stainless Fastenings" . . . . carries large and complete stocks of 4360 different items and is continually adding others . . . maintains large stocks of metals in bars, rods, wire, sheet and other basic forms from which special fastenings can be quickly made. Write for 1945 Catalog.

THE H. M. HARPER COMPANY
2651 Fletcher Street, Chicago 18, Illinois
BRANCH OFFICES: New York City • Philadelphia
Los Angeles • Milwaukee • Cincinnati • Houston
Representatives in Principal Cities

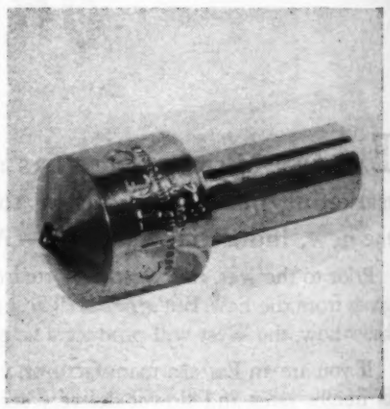
HARPER
EVERLASTING FASTENINGS
BRASS • BRONZES • COPPER • MONEL • STAINLESS



creased. Model AR is a combination steam cleaner and high-pressure rinse unit for the removal of oil, grease, mud, and encrustations from heavy-duty equipment, and for cleaning of buildings and machinery. Oil and gas fired models are available. Equipment is furnished as stationary, portable, or trailer type. Clayton Manufacturing Co., Alhambra, Calif.

Dressing Tools

Dressing tools consisting of diamonds set in solid copper shanks as well as solid copper matrices are announced. It is claimed that the heat-conducting quality of



copper enables the tools to throw off effects of intense heat rapidly and clamp the diamond firmly in the setting. The Cleveland Industrial Tool Corp., 4713 Euclid Ave., Cleveland.

Motor Brush Holder

Brush holder for electric motors is fabricated from heavy sheet brass. Clamp mounting on the stud eliminates necessity for close tolerances on stud diameters, and permits use of commercial bar stock. The construction is claimed to avoid stud marring and to allow easy removal and replacement. A stop screw prevents the displacement of the brush under shock. Undercut trigger for spring adjustment maintains position under shock and vibration, and cotter pin and slip stud allow rapid spring replacements. Available for

How Rutland Profits with Bowser EXACT Liquid Control

When a single type of equipment serves a manufacturer in many different ways, that's a definite plus.

Take, for instance, the Bowser Meters in the plant of the Rutland Fire Clay Company, Rutland, Vermont, nationally known makers of heat resisting specialties. First, Bowser Meters measure incoming solvent—an obviously important check-up. Then, they measure—right down to the exact spoonful—the liquids going into Rutland products.

And in both operations, Bowser Meters paid off handsomely in these ways:

Uniformity of Product—Human error is eliminated.

Money-saving—A Bowser Meter on the intake line stopped discrepancies and resulting losses.

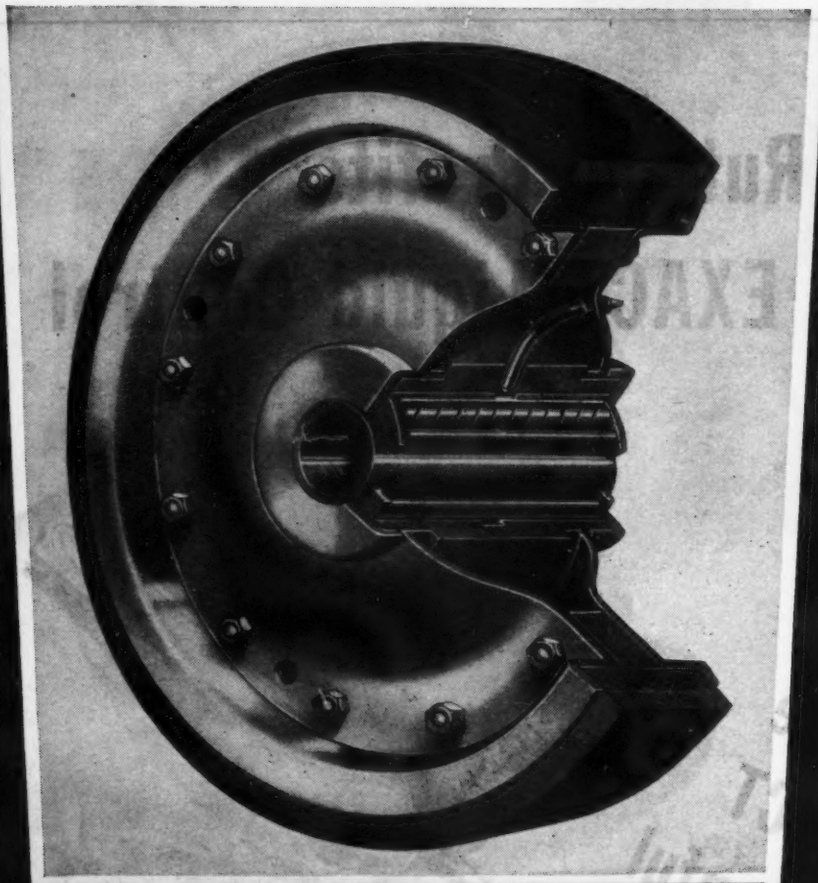
Time and Labor Saving—An operator sets the Bowser Predetermining Meter for the amount needed for a mix . . . then goes about other work. Time and labor is saved! Production steps up!

Your operation may be entirely different from that of the Rutland Company, but somewhere in your plant there is a job that can be done better, quicker and more economically by a Bowser Meter, Filter, Proportioner, Lubricating System, Oil Conditioner, Pump or other Bowser unit. Write for complete information about how Bowser equipment can give you important savings and service. Address: BOWSER, INC., Dept. 27-D, Fort Wayne 2, Indiana.

Not only has Bowser's war production earned the Army-Navy E . . . Bowser equipment has helped earn it for scores of other companies.

BOWSER
SINCE 1885

THE NAME THAT MEANS
EXACT CONTROL OF LIQUIDS

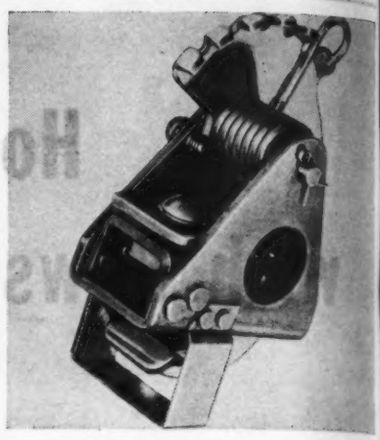


DARNELL
Casters & Wheels

A SAVING AT EVERY TURN

Save Money. Save Floors. Save Effort. Save Equipment. Save Time and Temper. All these advantages are yours when you install Darnell

DARNELL CORP. LTD.
LONG BEACH 4, CALIFORNIA
60 WALKER ST., NEW YORK 13, N.Y.
36 N. CLINTON CHICAGO 6, ILL.



½- to ⅞-in. diameter stud mountings for use in motors of ½ or more horsepower. Publix Metal Products, Inc., 100 Sixth Ave., New York 13.

Air Control

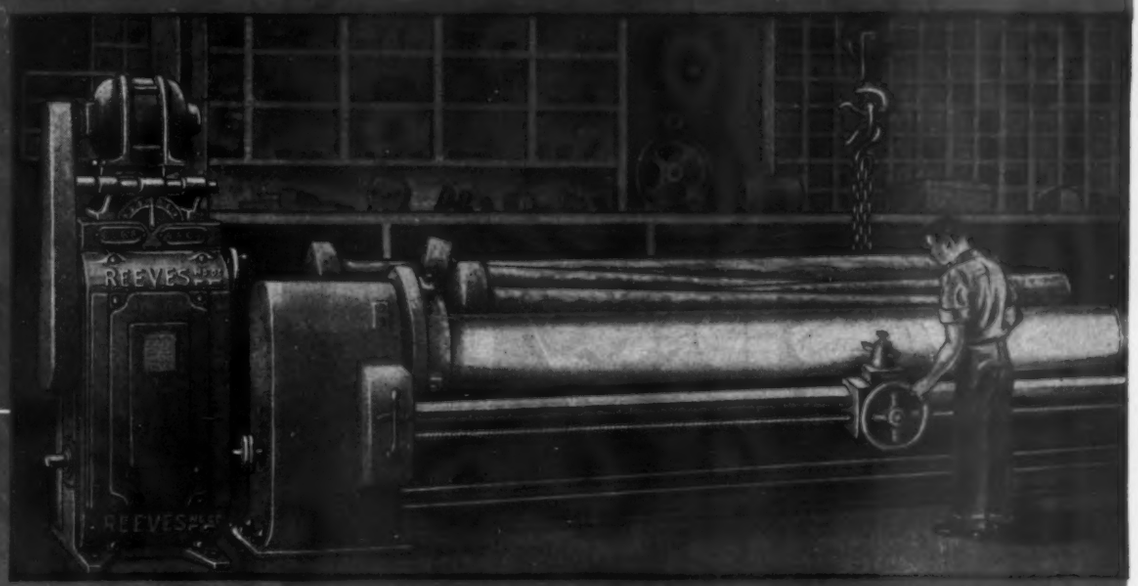
Ashcraft air control for controlling volume of air in the water storage tanks of shallow well pneumatic water systems is claimed to be simple, rugged, and durable. Rubber diaphragm is the one single moving part, which combines valve head, gland seal, and float hinge. The valve has stainless steel orifice and is completely sealed, having no water cavities. Body is either cast brass or cast iron. Unit is compact, lightweight, measures 1¾ inch between wrench flats. Control is for applications up to 80-lb. p.s.i. tank pressure. Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Floor Covering

Pabco Sani-Grip is a mastic floor covering for application to steel, galvanized iron, suspended concrete, or interior, new, unpainted wooden surfaces. Said to be adapted to exterior and interior exposure, to resist salt water, gasoline, lubricating oil, kitchen grease and fats. Also, to have germicidal tendencies toward mold and bacterial micro-organisms. Protection against the building-up of dangerous static electricity charges is afforded by conductive properties. A companion material, Pabco Grip-Dek is a liquid plastic material

HOW REEVES STEPS UP PRODUCTION

OF PROPELLER SHAFTS FOR LIBERTY SHIPS



40-Hour Job Cut to 23 Hours by Applying Reeves Variable Speed Transmission to Lathe in Operation from 19 to 24 Hrs. Daily for 2 Years

• Typical of the ingenuity and "know how" which made America "The Arsenal of The Democracies" is the story about two small West Coast machine shops.

To machine the huge propeller shafts for Liberty ships, so urgently needed in the Pacific War, every possible facility was pressed into service. These shafts were from 13″ to 20″ in diameter, and from 17 to 22 feet long. They were too large for lathes ordinarily found on the West Coast, but this did not stop the shop owners.

The first shop converted a big old belt-driven lathe to provide modern controlled speed operation, with a large REEVES Variable Speed Transmission. Production was stepped up from one completed shaft every 40 hours, to one finished every 23 hours.

The ingenuity of the other shop proprietor was equally interesting. He built his own lathes out of concrete and old automotive parts, and with controlled speed provided by REEVES transmissions, is turning out finished shafts in greatly increased numbers.

In both of these applications REEVES Speed Control made possible the maximum peripheral cutting speed at every stage of the processing of these lathes.

Here again, the adaptability, accuracy and rugged strength of REEVES Speed Control contribute to the war effort. Write for copy of 96-page Catalog F-450.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

THE 3 BASIC REEVES UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range—2:1 to 16:1 inclusive.

VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit, speed ratios 2:1 to 6:1 inclusive.

REEVES *Accurate Variable* SPEED CONTROL

Use FIBREEN

for DEPENDABLE PROTECTION TO DESTINATION

MACHINES shipped in open cars or stored in the open, are protected from the elements with *Fibreen*.

BALES or bundles of all shapes and sizes are wrapped with *Fibreen*. It's pliable.

CRATES, with engines, paper, or machine tools wrapped in *Fibreen*, give dependable, low cost protection.

CASES lined with *Fibreen* are moisture and dirt proof.

HEAVY machines, too large to wrap, are covered with *Fibreen*, as pictured.

ROLLS of all sizes and weights are easily wrapped with *Fibreen*.

PROTECT your shipments against dirt, water, exposure. PREVENT losses and complaints due to damage in transit caused by torn wrappings and inadequate case linings. Use *Fibreen* — the waterproof, reenforced paper that is so amazingly tough! *Fibreen* is made in weights and widths to meet every need. Tell us your wrapping problems. Let us help you solve them.

Send for a "working" sample of *Fibreen*. See how tough it is! Keep a few rolls in your shipping room.

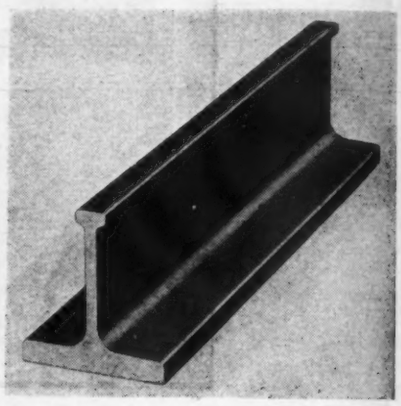
THE SISALKRAFT CO.
205 W. WACKER DRIVE-CHICAGO 6, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X SISALTAPE AND COPPER ARMORED SISALKRAFT

claimed to provide a slip-proof, fire-resistant, non-corroding floor surface. Applied as received, spread with trowel. Is said to dry quickly, adhere to steel, galvanized iron, concrete, to be resistant to attack by gasoline and oils. Colors are green, white, terra-cotta, blue, gray. The Paraffine Cos., Inc., 475 Brannan St., San Francisco.

Tramrail System

Designed for moving and handling of raw stock, parts in process, and finished products, the Ohio Tramrail System consists of several one-piece rolled steel tramrail sections, of simple design and heavy construction, suitable for various span and load conditions. Trolleys are available for both chain and electric hoists. Also included are monorail switches, monorail cranes, and below-the-hook devices. Special feature is "Shielded Electrification," claimed to be a safe means of getting power to trolleys and cranes, with live conductor bars covered against contact by workmen. Rail also comes cut to length according to need. Forker Corp., 1805 East 47th St., Cleveland 3.



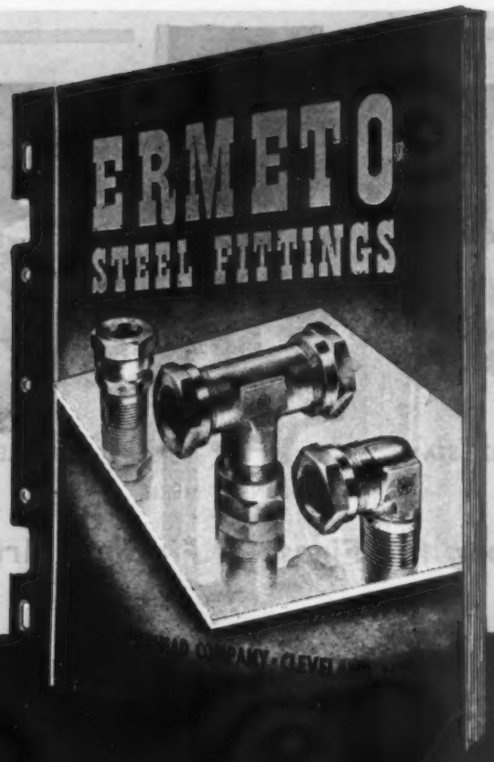
Coating for Aluminum Paint

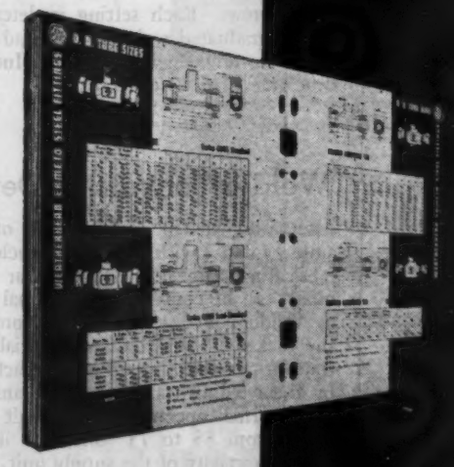
Monex is a non-oxidizing plastic coating claimed to be highly resistant to salt air, brine, moisture, weathering, petroleum oils and greases, and other agents that destroy aluminum paints. Coating is said to be applicable for interior or exterior use on any surface, to air dry or bake, forming tough film, and to withstand temperatures from —30 to over 1000 deg. F. Monon Resins & Chemicals, Inc., 1325 Summer St., Hammond, Ind.

Portable Pumping Unit

Self-contained rotary pumping unit powered by a Wisconsin gasoline engine is announced for applications where temporary pumping facilities are needed. Consists of 90-g.p.m. bronze fitted standard pump with built-in chatter-proof relief

A must FOR YOUR CATALOG FILE





Every engineer, designer, service-man and industrial purchasing agent should have a copy of our newest Ermeto Fittings catalog, available for ready reference. This newest edition is the most complete to date and is yours for the asking. Write today or phone one of our branch offices.

Check these ERMETO features:

1 Easy and low cost installation. No flaring, welding, threading or soldering required!

2 Adaptable to all types of tubing connections—hydraulic, oil, water, gas and fuel lines!

3 Ermeto connections hold beyond the burst strength of the tube itself!

4 Ermeto joints withstand excessive vibration for an indefinite period!

5 Long life—proved in thousands of installations!

6 Unaffected by extreme degrees of heat or cold!

Look Ahead with Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO

Branch Offices: New York, Philadelphia, Detroit, Chicago, St. Louis, Los Angeles

Among the Finest of Finished Articles

. . . *and* LEA Methods and Compositions are contributing factors

Of the many different "war" items finished with the help of our technical men and our compositions, none gives us quite the kick that these highly prized medals do. They're for the lads who have "expended" something, for us back here . . . for the lads who did something beyond the call of duty.

These medals are products of the fine craftsmanship employed at American Emblem Company, Utica, New York whose normal business of producing auto, radio and other nameplates displaying such outstanding names as General Motors, General Electric, Chrysler, RCA and International Business Machines, has been laid aside for the duration.

We're particularly happy to have a modest part in the production of these medals and are displaying them because (1) they are different and (2) you may have a troublesome finishing problem somewhat similar.

American Emblem Company has this to say about LEA Compound: "It eliminates stain spots, excellent for deburring, gives better control of grain, achieves faster cutting, eliminates drying, and assures a uniform finish."

. . . advantages which apply equally well to the company's peace-time products such as these nameplates.

THE LEA MANUFACTURING CO.

WATERBURY 86, CONN.

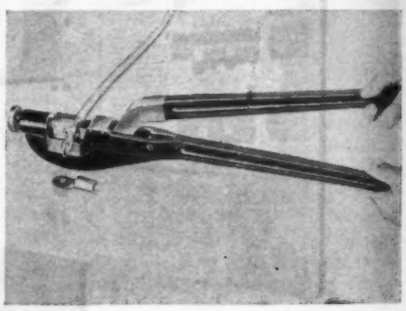
Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

4-LM-5

valve, oil-immersed drive, and 2-hp. gasoline engine, all mounted on fabricated steel base fitted with telescopic handles for convenience in moving. Complete unit weighs 330 pounds, and can be carried by two men. Blackmer Pump Co., Grand Rapids 9, Mich.

Hand Tool

Husky, lightweight universal hand tool, known as Hytool MY28, for installing both copper and aluminum electrical connectors on large cables, is reported. Tool is said to be adaptable to many sizes and types



of connectors, and suitable for general factory and maintenance work. The holding-die adjustment is easily made by a large thumbscrew. Each setting is determined by the graduated scale on the head of the tool. Burndy Engineering Co., Inc., 107 Bruckner Blvd., New York 54.

Welder-Conversion Device

Alternating-current welding sets of 1000 amps., for use with automatic machines in fabricating large, thick-plate war equipment, can be converted for manual service by welder-conversion device, according to the maker. Unit consists essentially of a transformer and a group of six reactors fed by the welding transformer. Transformer steps normal operating open-circuit voltage down from 85 to 75 volts, and increases current capacity of the supply unit. With it the welder can be converted to serve as a power supply to six individual, manual welding operations, each having current range of 45 to 270 amps., in approximate equal increments of current. Output of

Reach · Capacity · Speed

IN MATERIALS HANDLING

with the AMERICAN REVOLVER

Here is a closeup of large scale materials handling. This AMERICAN REVOLVER, operated by a 60-year old man, moved 2,382 tons of coal in an eight-hour shift.

Have you a job of materials handling with hook, magnet, or bucket—large or small? Let AMERICAN work with you.

An AMERICAN REVOLVER—gantry mounted revolving crane in operation at river docks.

4515

Plan now . . . but wait for **AMERICAN!**

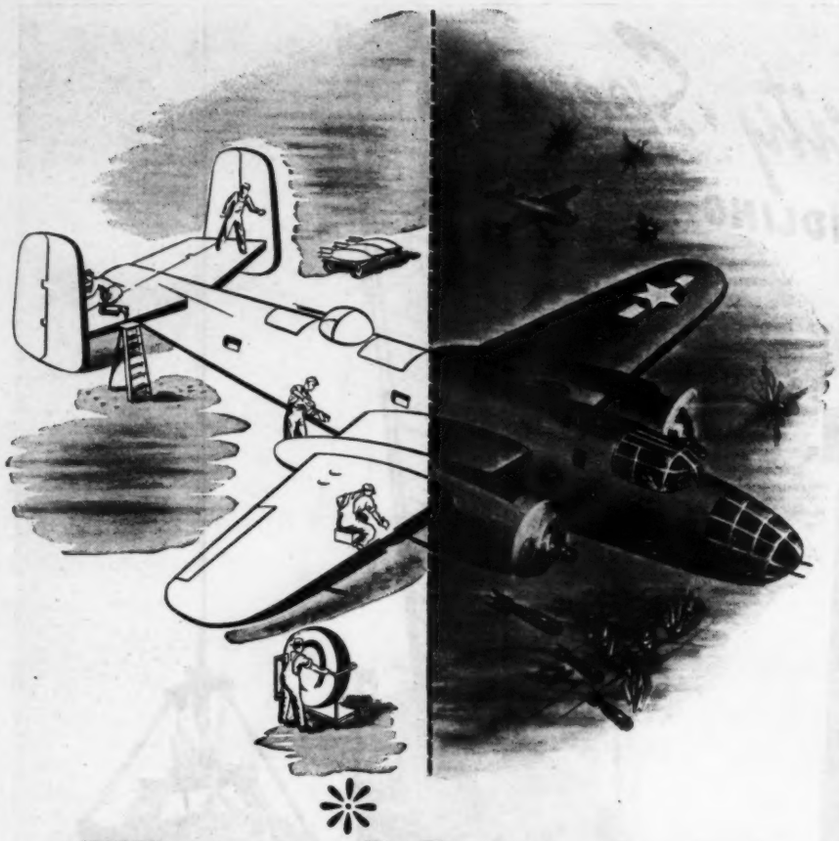
AMERICAN MATERIALS HANDLING *for* EVERY INDUSTRY

AMERICAN HOIST & DERRICK CO.

Saint Paul 1, Minnesota

CHICAGO SAN FRANCISCO NEW YORK

Wherever wire rope is fastened . . . . use genuine **CROSBY CLIPS** *with the Red-U-Bolt*



War of Movement

This is a War of Movement. The most important thing is to get men and equipment "there" on time. What's more, today's "there" may be a thousand miles away tomorrow.

This important "common carrier" — the caster — has an active part in this War of Movement from start to finish.

Take this B-25 Medium Bomber for instance . . . Before she started on her first mission, casters carried raw materials to and through subcontractors' shops, then to the jigs where the big ship was hatched . . . the assembly line . . . through modification . . . and out to the point of the initial bombing run . . . from then on the caster efficiently serves in maintaining the big ship and her cargo and crew.

Strong and fleet Rapids-Standard "Steel-Forged" and exclusive "Flame-Hardened" Casters are especially designed to do just this job. They will constantly take the brunt of heavy loads and give long wear-life. What's more, their construction advantages mean a minimum of replacement cost.

Specify Aircrafters. They will serve you well and faithfully in this War of Movement.

Write for Manual 65-2C

RAPIDS-STANDARD Aircrafter
STEEL-FORGED CASTERS

THE RAPIDS-STANDARD CO., INC.

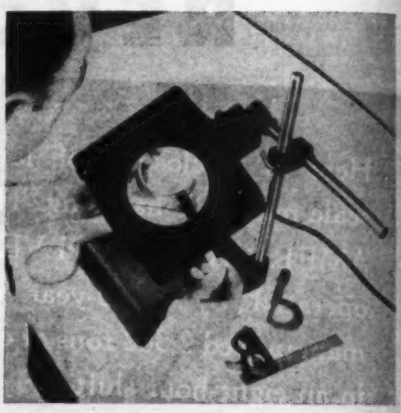
370 Bond Avenue, N. W., Grand Rapids 2, Michigan

Offices in All Principal Cities

the six reactor groups is controlled by placing two bayonet plugs in one of 20 possible settings. Westinghouse Electric & Mfg. Co., Pittsburgh 30.

Illuminated Magnifiers

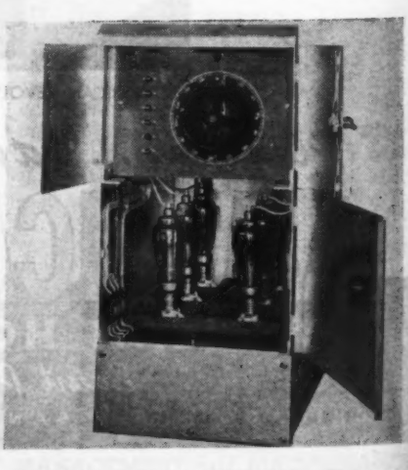
Inspection work demanding careful scrutiny of small objects is claimed to be performed accurately and easily with C-Master magnifiers. Two of three all-angle illuminated models are stand models and the third is a portable hand type. Lighting equipment of stand Model 410 and portable Model 610 consists of four incandescent



tubes which can be lighted two at a time or all four at once. Two fluorescent tubes are used in stand Model 210. All are claimed to be shadow-free, compact, and easy to handle. Large, clear 4½-in. double convex lens, ground and polished, magnifies all objects twice. Squinting and eyestrain are said to be eliminated, because the swivel-action magnifiers provide an undistorted view of the work. Ullman Products Co., 857 Fourth Ave., Brooklyn 32, N. Y.

Electronic Motor Control

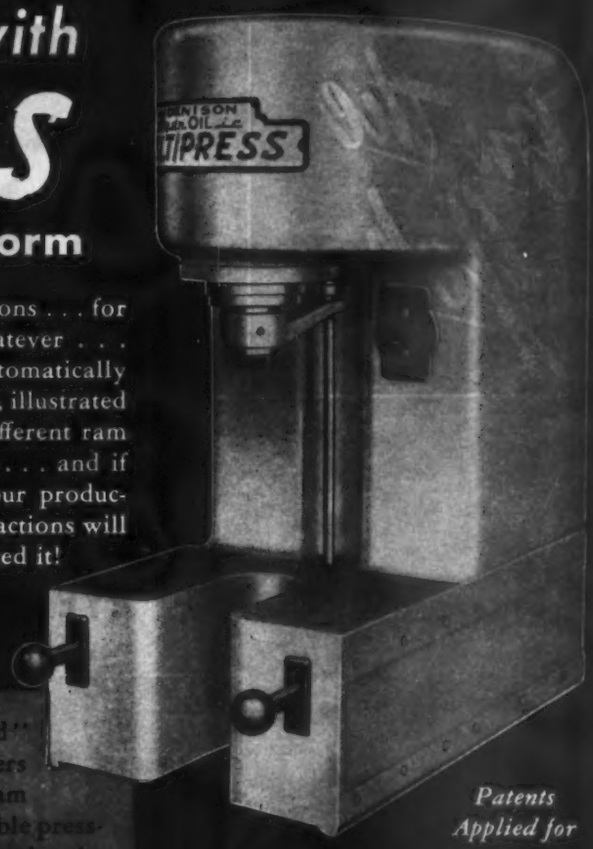
Electronic control unit of 25 horsepower is announced for driving d.c. motor from 3-phase a.c. line and obtaining wide stepless speed adjustment directly from motor shaft. IR drop in motor armature is compensated for, and unit is claimed to maintain practically straight-line regulation over wide changes in load. Also includes revers-



Speed Up Production with MULTIPRESS

the four-ton giant in midget form

If your war production requires up to 4-ton pressing operations . . . for staking, crimping, punching, bending, assembling, or whatever . . . MULTIPRESS can speed it! There are mechanically and automatically controlled MULTIPRESSES. In the mechanically controlled type, illustrated here, there are three different ram actions to choose from . . . and if pressing enters into your production, one of these three actions will very likely fit it and speed it!



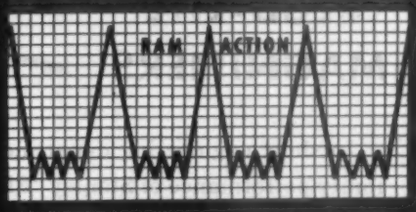
Basic Unit
$575.00

Patents Applied for

1 "Basic" MULTIPRESS offers simple, accurate and positive control of ram action through every phase of the pressing operation. Fully depressing the control levers effects rapid ram movement (200 ipm). Slow movement of the control levers affords gradual acceleration and deceleration of ram movement. Slightly releasing hand pressure upon either lever, stops the ram wherever it may be in its downward travel, and work may be positioned accurately beneath it. Releasing both levers causes the ram to rise to its upper limit and stop.

2 "Multi-Speed" MULTIPRESS offers rapid approach of ram to work, and adjustable pressing speed. Fully depressing the control levers brings the ram to the work at a speed of 200 ipm. Slightly raising the levers slows the ram at once to any pre-selected pressing speed between 20 and 200 ipm. A simple knurled-knob and lock-nut permit easy and accurate pressing speed adjustment. Thus, Multi-Speed means faster production and ability to adjust pressing speed to the characteristics of the material being processed.

3 "Vibra-Press" MULTIPRESS is unique in its ram control and action. Depressing the hand levers causes the ram to descend, exert pre-selected pressure on the work, and then make any number of repeated pressure strokes upon the work until the levers are released . . . and those strokes are precision-timed and accurately uniform as to pressure, which may be preset anywhere between 1,600 and 8,000 pounds. Repeat strokes are adjustable in length from a few thousandths to 1/2-inch; by means of an easily adjusted knurled-knob and lock-nut.



In all models, single hand-lever or foot-pedal control may be substituted for the dual hand-levers, and ram travel may be adjusted anywhere between 1/16-inch and 6 inches. Maximum daylight opening between ram and table is 11 inches. Maximum stroke 6 inches. Matching benches, table extensions, side shelves, and a variety of bolster plates are available. Write for details of MULTIPRESS, the production giant with amazing ram action control!

The DENISON Engineering Co., 1154 Dublin Rd., Columbus 16, Ohio

DENISON
EQUIPMENT *in* APPLIED
*Hydr*OILics

SEND TODAY *for this complete bulletin on the new* **MULTIPRESS**

TO INCREASE EYE EFFICIENCY

STANLEY "FLUD-LITE" MAGNIFIERS

In shop, engineering department, or dispensary, the high visibility performance of Stanley "Flud-Lite" Magnifiers saves errors, time, trouble. They raise eye-efficiency by (1) floodlighting the work with shadow-free fluorescent light, and (2) magnifying the work through a high-quality 5-inch lens. For super-magnification, the Stanley Auxiliary Lens, 2½-inch, is easily attached. Check your needs and write today for illustrated folder. Stanley Electric Tools, Division of The Stanley Works, New Britain, Connecticut.

STANLEY

STANLEY ELECTRIC TOOLS

ing, dynamic braking, controlled, and adjustable acceleration. In sizes up to 500 horsepower. Units may be operated in place of stationary motor generators, or may be made portable. Operate in any position and without any foundation. Provide d.c. voltage from 0 to 270 volts, or from 0 to 600 volts, according to model. Complete locked enclosures, with forced draft cooling. Electron Equipment Corp., 917 Meridian Ave., So. Pasadena, Calif.

Solderless Connector Lug

Combination type "XL" solderless lug accommodates more than one size of wire. Made of cast copper alloy, the fitting is claimed to be so formed that high clamp-

ing pressure is exerted by the pressure plate, effecting high conductivity on any one of the wires in ranging sizes. Socket wrenches are furnished with the lug. C. Z. Electrical Mfg. Co., Brooklyn, N. Y.

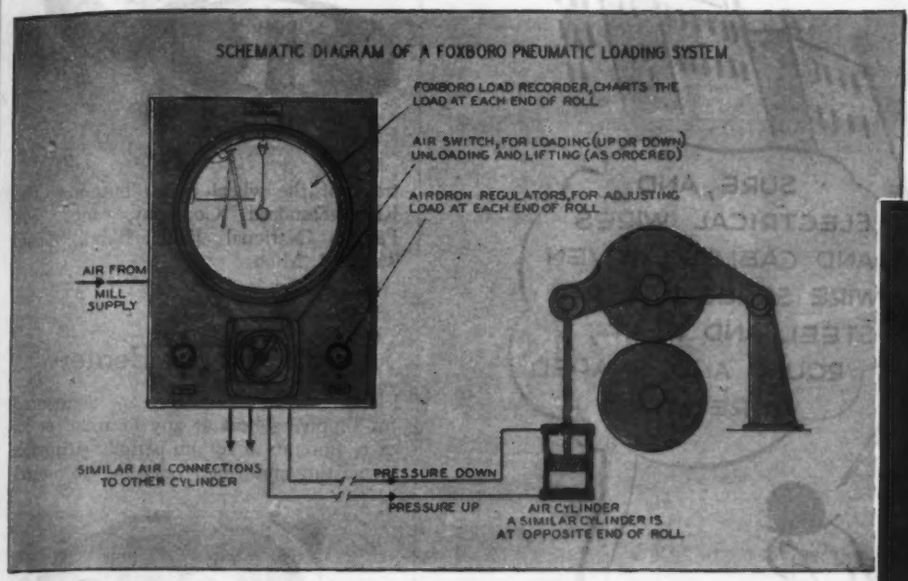
Oil and Rust Preventive

Gibralar Rad-Treat, a compounded oil and rust preventive said to emulsify quickly with water or any anti-freeze, is not a solvent, but will keep radiators, water jackets, and cooling systems clean and prevent rust and corrosion, according to the manufacturer. Also for lubrication of packing glands in pumps, preventing shrinking and glazing of packing, and neutralizing acid condition produced by caustics. Claimed to be harmless to metals and rubber. The Hood Refining Company, 171 N. Hamilton Ave., Greensburg, Pa.

Wheel

AGH air wheel with large demountable, cushion-type roller bearing rubber tires has been announced for use on materials handling equipment. Wheel of 6-in. diameter by 2-in. face in axle sizes of ¾, ⅞, and 1 in., with a hub length of 2 1/16 inches, has a capacity of approximately 250 pounds. Equipped with roller bearings for free, easy rolling. Heavy section cushion rubber wheel is held in place by two locking hub plates of magnesium, which places the

BIGGEST ADVANCE EVER MADE in Applying Roll Pressure!


SCHEMATIC DIAGRAM OF A FOXBORO PNEUMATIC LOADING SYSTEM
FOXBORO LOAD RECORDER, CHARTS THE LOAD AT EACH END OF ROLL
AIR SWITCH, FOR LOADING (UP OR DOWN) UNLOADING AND LIFTING (AS ORDERED)
AIRDRON REGULATORS, FOR ADJUSTING LOAD AT EACH END OF ROLL
AIR FROM MILL SUPPLY
SIMILAR AIR CONNECTIONS TO OTHER CYLINDER
PRESSURE DOWN
PRESSURE UP
AIR CYLINDER
A SIMILAR CYLINDER IS AT OPPOSITE END OF ROLL

Schematic drawing (left) shows operating principle of Foxboro Pneumatic Loading. Below is complete control panel with Pressure Recorder, Dual Air Switch and pressure-adjusting Airdron Regulators.

Foxboro Pneumatic Loading gives calibrated, "cushioned" pressure with fingertip control

A turn of two knobs . . . that's all there is to loading any roll equipped with Foxboro Pneumatic Loading!

Pressures are maintained automatically and precisely. The smooth, cushioned action of the air cylinders compensates for variations in material thickness and for any out-of-roundness of the rolls. This action also snubs bouncing — often permits higher roll speed. The special air switch gives instant unloading and reloading; if desired, it also provides reverse pressure for lifting the roll out of contact. Roll ends are usually loaded independently to permit compensation for machine conditions, but the cylinders may be manifolded to work together.

For many press-roll operations, Foxboro Pneumatic Loading offers various radical improvements, such as greater overall extraction and closer control of final moisture content, thorough saturation and uniform removal of excess liquid. Corresponding gains in quality and uniformity are often achieved in finishing processes, as well.

Phone or write the nearest Foxboro Office for a copy of detailed Bulletin B306. If desired, a Foxboro engineer will gladly call to discuss how this unique loading can improve your roll operations. **The Foxboro Company, 24 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities.

Foxboro Pneumatic Loading has brought new efficiency to paper mill operations.

Also widely used today on textile operations such as slashing and dye-padding.

FOXBORO REG. U. S. PAT. OFF. **PNEUMATIC LOADING**

BUT I THOUGHT ROEBLING MADE WIRE ROPE?
SURE, AND ELECTRICAL WIRES AND CABLES, WOVEN WIRE SCREEN, STRIP STEEL AND FLAT, ROUND AND SHAPED WIRE, TOO!
ROEBLING
JACK MARKOW

Roebling produces every major type of wire and wire product . . . toaster cord to telephone cable . . . bridge cable to wire rope . . . fine filter cloth to heavy grading screen . . . strip steel and flat wire to round and shaped wire . . . all Roebling products. All the result of over 100 years of wire specialization.

John A. Roebling's Sons Company, Trenton 2, N. J.

JR ROEBLING

ROEBLING

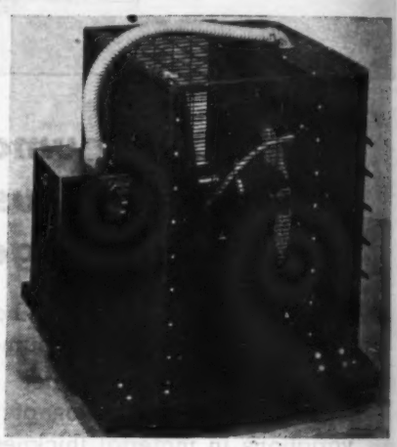
PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • SLINGS • SUSPENSION BRIDGES AND CABLES
COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING

tread of the wheel under tension. The Rapids-Standard Company, Inc., 308 Peoples National Bank Bldg., Grand Rapids 2, Mich.

Portable Air Heater

Electromode unit heaters are announced for supplying heat at any location, or for extra amounts at certain periods. Adaptable for heating emergency huts used to protect



men working outdoors. Heater elements, fan motor, contactor, and switch are all mounted on one base provided with casters for easy mobility. In the 20-kw. heater, standard rectangular heater elements are used consisting of sheathed resistors cast in one-piece finned aluminum castings. Electric Air Heater Co., Mishawaka, Ind.

Electrode Holder

Electrode holder, known as Marine Model, is of the resillient-jaw type, fully insulated. Removing or re-attaching front assembly may be accomplished by hand, without

New ARO
PNEUMATIC DRILL

for High Speed... Sustained Torque!

Illustrated
Model 109
2500 R.P.M.

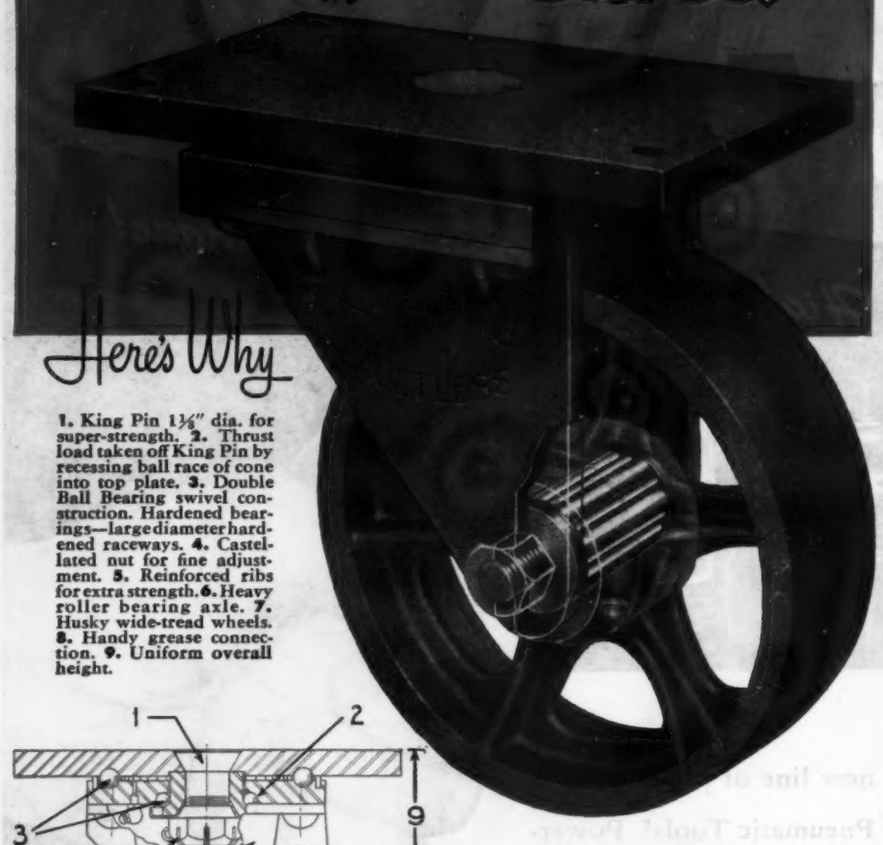
Now—another new line of production-speeding ARO Pneumatic Tools! Powerful ARO drills with one-piece aluminum housing now available—can be equipped with $\frac{3}{16}$," $\frac{1}{4}$" or $\frac{5}{16}$" Jacobs Chucks.

Available in four models operating at 2500 R.P.M. and 4000 R.P.M. Ideal for aircraft work and similar jobs requiring high speed and sustained torque. Light in weight for less fatigue. All tools ARO-engineered for perfect balance and round-the-clock dependability.

Designed with built-in oilers...4-bladed rotors... hardened and ground cylinders... 4-ball-bearing construction... gears and gear cages precision cut and ground for perfect alignment, reducing gear wear to a minimum. Write for new bulletin. The Aro Equipment Corporation, Bryan, Ohio.

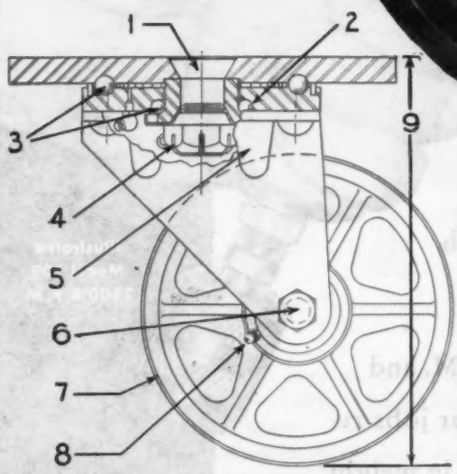
PNEUMATIC ARO TOOLS
THE ARO EQUIP. CORP.
BRYAN, OHIO

MOVES BIGGER LOADS with less effort... SAFELY



Here's Why

1. King Pin 1¼" dia. for super-strength. 2. Thrust load taken off King Pin by recessing ball race of cone into top plate. 3. Double Ball Bearing swivel construction. Hardened bearings—large diameter hardened raceways. 4. Castellated nut for fine adjustment. 5. Reinforced ribs for extra strength. 6. Heavy roller bearing axle. 7. Husky wide-tread wheels. 8. Handy grease connection. 9. Uniform overall height.



SAVES MANPOWER

This super caster is scientifically strengthened at the right places so as to carry increased war loads and endure the punishing fatigue of overtime schedules with minimum attention. Its unfaltering performance is due to a combination of well balanced features . . . based on over half a century of specialized experience—backed by precision manufacture and rigid factory inspection. Used on production lines, hauling heavy supplies, moving any kind of mobile equipment—this caster rolls with less effort, at less cost per mile. Available in 6", 8", 10" and 12" diam. wheels and capacities to suit your specific requirements. Regardless of what you make or move, there's a Faultless Caster *especially designed* to do it better. Our representative will gladly show you why, or write for literature. FAULTLESS CASTER CORPORATION, Dept. F-M-4, Evansville 7, Ind.

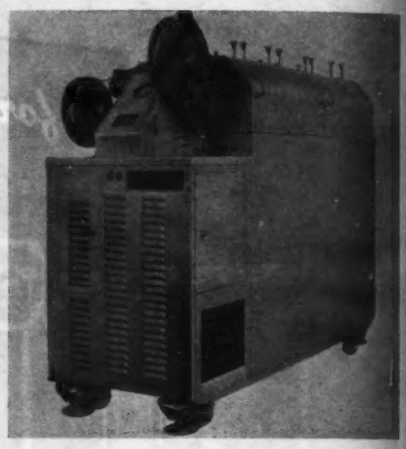
Canadian Factory: Stratford, Ont. Branches in Boston, New York, Chicago, High Point, St. Louis, Detroit, Los Angeles. In other cities, consult your classified phone directory

Faultless
INDUSTRIAL CASTERS

shutting down the welding machine, and is said to require but 15 seconds. If operator removes front whenever leaving the job, holder may be left anywhere without danger of an arc, according to the manufacturer. Detroit Electrode Holder Mfg. Co., 2088 Forest Ave., W., Detroit 8.

Film Processor

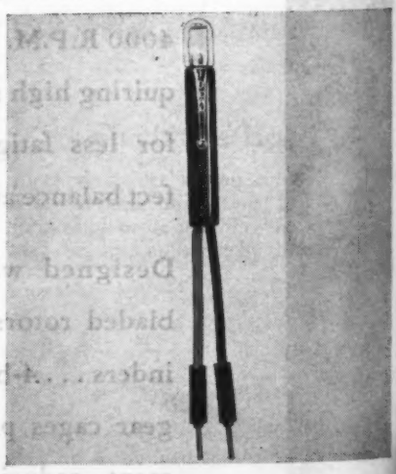
Model 11 film processor has facilities for processing 16-mm. negative, positive, and reversal film. Can be used in selling, sales promotion, publicity, visual education of



employees, engineering designs, production processes, time and motion studies, and other essential business functions. The Houston Corp., 11801 Olympic Blvd., Los Angeles 25.

Circuit Tester

Lo-Volt Test Glo, for testing circuits from 5 to 50 volts, is claimed to simplify testing of open circuits, burned out fuses, and to be used for indicating the relative value of line voltage. The incandescent "glow" lamp is protected by a transparent plastic



housing. Over-all length is 7 inches. Tester is compact, can be carried in the pocket. Insulated test leads are 4 inches long. Ideal Commutator Dresser Co., 1416 Park Ave., Sycamore, Ill.

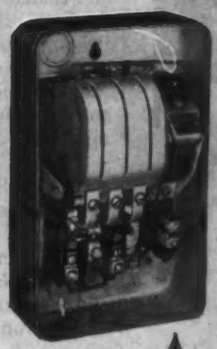
EVERY KIND, FOR EVERY MACHINE APPLICATION

★ DEPENDABLE

★ ATTRACTIVE IN APPEARANCE

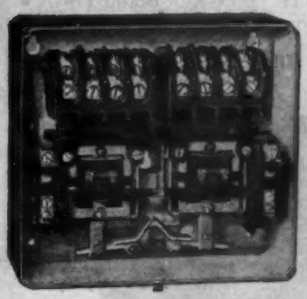
★ DESIGNED TO BLEND WITH MODERN MACHINES

Motor-starting Switch—Recommended for full-voltage starting of small motors. Manually operated. Operating mechanism trips free on overload, making it impossible to hold switch closed under injurious conditions.

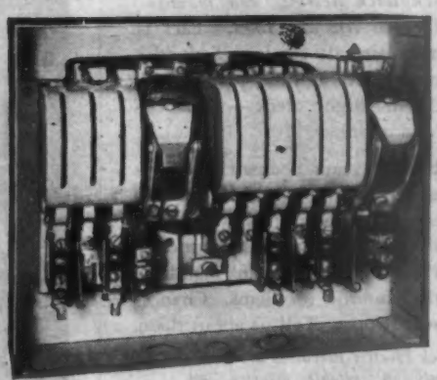


A-c Magnetic Starter—Can be used as a full-voltage starter of squirrel-cage motors, or as a primary switch for wound-rotor induction motors. Provides dependable operation, safety to the operator and to the machines.

Reduced-voltage Starter—A manual, autotransformer-type starter for squirrel-cage induction motors. Undervoltage protection provides safety for the operator and the driven machine.



A-c Magnetic Reversing Switch—Especially for use on machine-tool or similar applications where it is necessary to run the motor in forward and reverse directions. Provides full-voltage starting and overload protection in both directions of operation.



A-c Multispeed Magnetic Starter—A full-voltage starter for two-, three-, or four-speed squirrel-cage motors. Provides dependable operation where motors are started frequently, and where remote control is desired—on pumps, blowers, ventilating fans, and machine-tool applications.

INDUSTRIAL CONTROL

WHAT IS YOUR APPLICATION?

G-E starters come in a variety of enclosures to meet any operating conditions in your plant. We'd like to send you any additional information you may want. And remember, our engineers will be glad to help you select the correct type of starter for your needs.
General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

MOVE MEN, MATERIAL and MERCHANDISE safely, surely and at low cost

THE "Sedgwick" WAY

PROPERLY PLANNED elevator and dumb waiter installations help reduce costs by moving men, material and merchandise up and down better and faster.

Sedgwick Electric Freight Elevators, for example, are specially designed to lift heavy loads—increase efficiency—simplify installation, service, repair and maintenance.

Sedgwick makes five standard freight elevators with capacities from 2500 to 8000 lbs. *But Sedgwick designs and manufactures elevators to lift any load.* Fact is, today, on many aircraft carriers, Sedgwick airplane elevators lift fighting planes from hangar deck to flight deck — capacities 85,000 lbs. and more.

For more than 50 years Sedgwick Freight and Passenger Elevators and Electric and Hand Power Dumb Waiters have helped many manufacturers solve cost reduction problems by solving their "man" handling and materials handling problems. Chances are we can solve yours. Tell us about them.

Sedgwick Electric Elevators are available only on suitable priority and delivery is subject to prior commitments to the Navy, Coast Guard, Merchant Marine and Army. Hand power equipment is available without priority.

Sedgwick
MACHINE WORKS
138 W. 15th St., New York 11, N.Y.
ELEVATORS SPECIAL LIFTS
HOISTS DUMB WAITERS

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• TO TRANSFER DRAWINGS TO METAL, the Transfax process is announced by Eastman Kodak Co., Rochester 4. Flat metal surface is spray-primed, and coated. Drawing is laid on metal, and exposed briefly to arc or mercury vapor lights. Drawing is removed and surface of metal washed with weak ammonia water. Plate then is recoated with primer and is ready for cutting, drilling, or other operations.

• RUBBER CEMENT for bonding metals, wood, plastics, and ceramic material, with shear strength up to 3250 pounds per square inch. Non-thermoplastic. Named "Plastilock," it is water and aromatic oil-resistant. B. F. Goodrich Co., Akron.

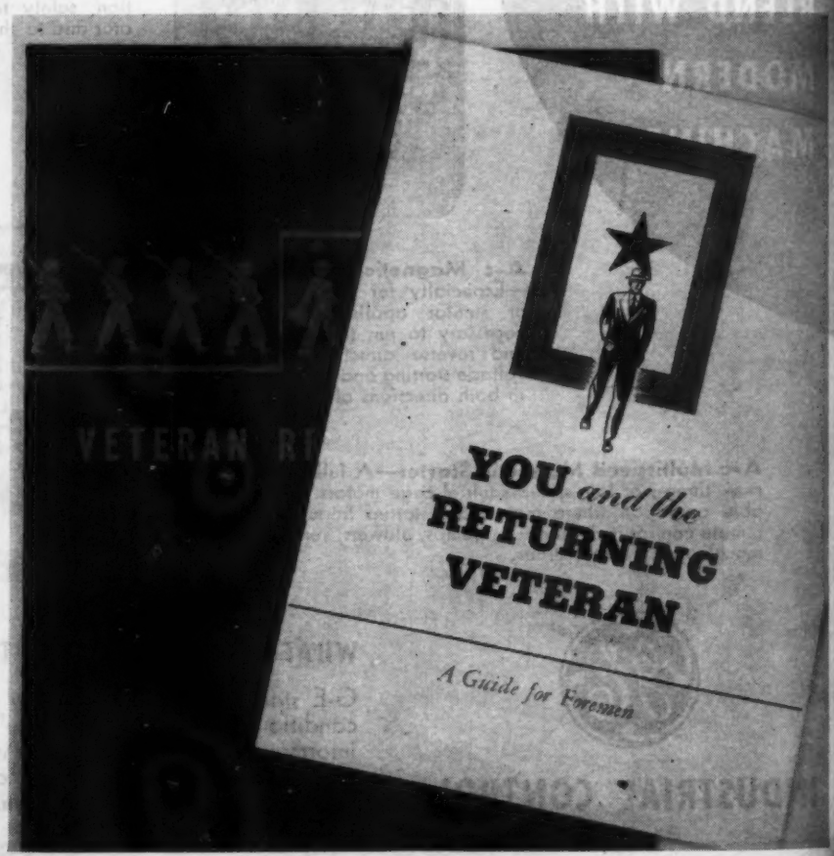
• REMELTED ALUMINUM SCRAP, claimed to have properties equal or superior to original metal. Treatment in remelting requires Boro-Klor-Boron-Trichloride, a gas, now in commercial production at Cooper Metallurgical Laboratory, 2135 Columbus Rd., Cleveland.

• PAINT BRUSHES with nylon bristles, said to apply paint more rapidly and outwear China hogs' bristles. Present sales restricted. Rubberset Co., 59 Ferry St., Newark, N. J.

• WORKERS' HEALTH SERIES, a dozen illustrated leaflets of U. S. Public Health Service, to persuade employees of the importance of good physical condition. Such subjects as "Hold on to Your Teeth," and "Save Your Skin." Quantity discounts available. Superintendent of Documents, Washington, D. C.

• FIREPROOFING TREATMENT for garments of industrial workers exposed to fire hazards. Garments are cleaned as well as fireproofed in laundry-like service. Flamesafe Co., 5910 West Irving Park Rd., Chicago 34.

• WATERPROOF MATERIAL, called "Vitafilm," may be used as sheets or



METHODS FOR HELPING VETERANS get resettled in industrial jobs are described in two manuals for supervisors, published by Allis-Chalmers Mfg. Co., Milwaukee, Wis., and Summerill Tubing Co., Bridgeport, Pa. Both discuss the veterans' viewpoint, and list major steps recommended for dealing with them. Copies are available from the companies, on request

CHATTER...CHATTER...CHATTER...
WAS RUINING FINISH

SUN TABLEWAY LUBRICANT...

Ended Chatter, Produced Smoother Operation, Cut Down Rejects

A midwestern manufacturer was unable to obtain a satisfactory finish in grinding hardened parts, because of excessive chatter in the grinding machines. When he used a heavy oil, the machines were sluggish. When he used a thin oil, the tableways chattered and affected the finish of the work.

After changing to Sun Tableway Lubricant, it was possible to maintain smoother operation, and to eliminate chattering.

Fewer rejects were encountered, and the management standardized on this Tableway Lubricant throughout the plant.

Sun Tableway Lubricant, with its extreme pressure characteristics and non-gumming qualities, is an outstanding example of Sun's industrial lubricants.

For every type, make, and size of industrial machine, for prime movers, conveyors, pumps, compressors, electrical equipment, etc., there is a specially prepared Sun oil or grease. Call in the Sun Engineer in your area and find out about the savings possible with the right lubricant in the right place.

SUN OIL COMPANY • *Philadelphia 3, Pa.*

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTRY

THIS NEW AJAX COUPLING CATALOG

just off the presses!

Every man who designs, builds, sells, operates, or maintains direct-connected machinery is invited to get a personal copy of this new catalog covering Ajax Flexible Couplings.

It gives latest working data on all types including Standard, Mill Motor (taper bore), Shear Pin, Bolt-on, Brake Drum and Detachable Hub Couplings.

Phone your nearest Ajax Flexible Coupling representative or write direct to

AJAX

PATENTS MAKE JOBS

AJAX FLEXIBLE COUPLING CO. INC.

Incorporated 1920 **WESTFIELD, N. Y.**

twisted into thread for woven fabrics. A derivative of polyvinyl chloride. Suggested uses include sheets for sacks and enclosures, and fabric for garments and covers. Goodyear Tire & Rubber Co., Akron.

• CELLOPHANE that is greaseproof as well as waterproof. Used for packaging grease-covered metal parts to be stored or shipped. Sylvania Industrial Corp., 122 East 42nd St., New York 17.

• KEEPING SPRAY PAINT BOOTHS CLEANER by use of two compounds. One is mixed with water for water-washed booths, and tends to keep paint from adhering to metal surfaces, and from clogging pumps and piping. Other is applied to walls of dry booths as preventive of paint-sticking. Fidelity Chemical Products Corp., 430 Riverside Ave., Newark, N. J.

MAGNIFIED BINOCULAR VISION suitable for use in inspection work made possible by hand-size instrument of Edroy Products Co., 480 Lexington Ave., New York 17. Matched lenses aid third-dimensional vision or true depth perception. Folds small for pocket-carrying. Focal length from 8 to 14 inches, in three powers of magnification, now in production.

• NEW FILMS: *Let Us See*, 16-mm. sound-movie, dramatizes recommended practices of industrial lighting. Illuminating Engineering Society, 51 Madison Ave., New York 10.

Magic Wand of Industry—Arc Welding, 16- and 35-mm. sound movie in technicolor. Portrays progress of arc welding and includes close-ups and animated drawings of technique. Lincoln Electric Co., 12818 Coit Road, Cleveland 1. (Also from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh.)

Supervising Women Workers is one of 16 new supervision training films being released at $2 rentals by YMCA Motion Picture Bureau, 347 Madison Ave., New York. Complete list available.

Motion Study Applications, *Motion Study Principles*, and *Motion Study in Action* are newest additions to Motion and Time Study Film Library of State University of Iowa, Iowa City. Complete listing in catalog. University also has catalog of office and shop practice, supervision, and aircraft films. All for rental, some optionally for sale.

HEAT PROVER..QUICKLY REVEALS INCOMPLETE COMBUSTION

FREE Demonstration Test Will Help Solve Your Combustion Problems . . . Conserve Fuel . . . Increase Quantity and Quality of Your Product.

Today, like many engineers in both small and large industrial plants, you very likely want to know—*by accurate measurement*—the answers to these four vital problems:

1. **Just how efficiently do my boilers burn fuel?**
2. **How efficiently do wartime operators control them?**
3. **What have wartime overload conditions done to normal fuel economy?**
4. **And what, actually, is the status of my combustion control equipment?**

To all these questions—and more—Cities Service has the almost perfect answer in the Cities Service INDUSTRIAL HEAT PROVER. This unique instrument quickly analyzes combustion . . . accurately determines degree of fuel waste due to air deficiency or dilution. Thoroughly tested on practically every type of combustion equipment in this country and with every kind of fuel, the Industrial Heat Prover already has been adopted by users of steam power plants, open hearth furnaces, cement kilns, heat-treating apparatus, crucible furnaces and internal combustion engines. And for a very good reason.

Accurate combustion analyses made as a result of the Cities Service Industrial Heat Prover tests have effected considerable savings in fuel costs...reduced repairs and replacements on furnace linings, crucibles and refractories due to flame corrosion... and have led to increased production of better and more uniform products.

Why not get a Cities Service Industrial Heat Prover Test in your own plant? You may have it *without cost or obligation*—if you will simply mail the coupon at right. A Cities Service Engineer will then make an Industrial Heat Prover Test in your plant—at your convenience. Mail the coupon—today.

THE CITIES SERVICE INDUSTRIAL HEAT PROVER—a new, accurate combustion analysis instrument developed by the Cities Service Research Division enables those engaged in the oxygen control of furnace atmospheres to achieve greater combustion efficiency at less cost.

(This offer is available only in Cities Service marketing areas EAST of the Rockies.)

CITIES SERVICE OILS — ONCE-ALWAYS

Cities Service Oil Company
Room **272**
Sixty Wall Tower, New York 5, N. Y.

Gentlemen: Please arrange a Cities Service Industrial Heat Prover Test for my plant. I understand there is no charge or obligation for this service.

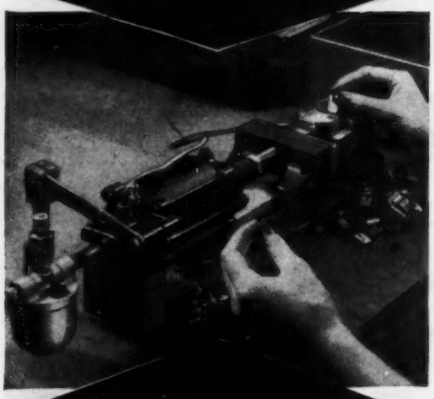
Name.....

Title.....

Company.....

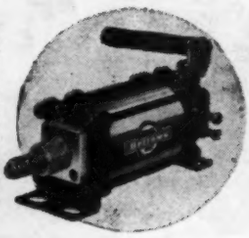
Address.....

AMONG SIGNIFICANT
Labor Developments



The use of Bellows Air Motors to enable comparatively unskilled help to do precision work, quickly, safely and with minimum fatigue.

In work or tool feeding, in opening and closing vises or fixtures, in small assembly operations, Bellows air motors supplant uniform, precise, controlled-air-power movement for operator "feel," making possible uniform production quantity and uniform production quality without strain or fatigue on the part of the operator



The Bellows Air Motor is a compact double-acting air cylinder power unit, with integral valve, speed and operating controls. Available in standard strokes from 1½" to 18" (special strokes up to 48"). Thrust 4.9 times air line pressure.

Get this
REMARKABLE PRODUCTION
Story Today!

Write for our new free Photo Facts File filled with large 8 x 10 application photos showing how ingenious production men are using Bellows equipment for faster, safer, better production. Production and cost data included. No obligation on your part, of course.

The **Bellows** Co.
861 E. TALLMADGE AVENUE
AKRON 10, OHIO

Significant Labor Developments

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, Member of the New York Bar

Period Surveyed: February 10 to March 10

TREND INDICATORS

Request for Deferment

AN EMPLOYER'S REQUEST for deferment of certain employees may be strengthened by an additional request of the procurement agencies of the government for which the employer is performing war contracts.

If the employer is on the WMC's critical activity list and wishes deferments for certain employees, he should submit:

1. To Selective Service, Form 42-A Special.

2. To the state director of Selective Service and the certifying officer of the government procurement agency, by April 25, another form soon to be announced. On this form all employees under 30 who are 2A or 2B should be listed in the order of their importance.

Ban on Homework Upheld

The Supreme Court upheld the Wage-Hour Administrator's ban on homework in the embroidery industry on the ground that a minimum wage rate of 40 cents an hour established for the embroidery industry could not be maintained without this prohibition. While the court held that to deprive the administrator of his power to prohibit such work would make the Act ineffectual in the industry, it pointed out that the Administrator might not, under the guise of enacting an order, bring about social and economic results that are unrelated to objectives of the Wage-Hour Law. (Walling vs. Gemsco, Inc., U. S. Sup. Ct.)

Call-In Time

Employees who report to work at the company's request are entitled to a minimum of 4 hours' pay, except where the lack of work is due to causes beyond the company's control. In this case the union had demanded 8 hours' pay plus any appropriate shift differential on the ground that the employees came to work through car pools and so were required to wait around when no work was made available for them. (Douglas Aircraft Company, Inc., WLB)

Bonus as Part of Compensation

The Wage-Hour Division recently announced that it would not insist upon the inclusion of bonuses granted more frequently than four times a year in the computation of regular rate of pay for overtime requirements of the Wage-Hour Law or the Walsh-Healey Act. Only in the case of obvious evasion of the overtime provisions would the Division deviate from this policy.

Bonuses granted at the discretion of the employer and bonuses computed on a predetermined percentage of the employees' earnings need not be included in computing overtime, while bonuses pursuant to a prearranged plan are considered part of the regular rate and so must be included.

Subpoena Power Sustained

The Circuit Court of Appeals upheld the Wage-Hour Administrator's right to obtain court enforcement of a subpoena issued to obtain access to the records of a company publishing two newspapers, neither of which had out-of-state subscribers. To uphold the company's contention that it must first be declared covered by the Act before it was subject to the Administrator's orders, the court explained, would be to deny the Administrator the power necessary to effectuate the Act. (Oklahoma Press Publishing Company vs. Walling, CCA-10)

Wage-Hour Inspections

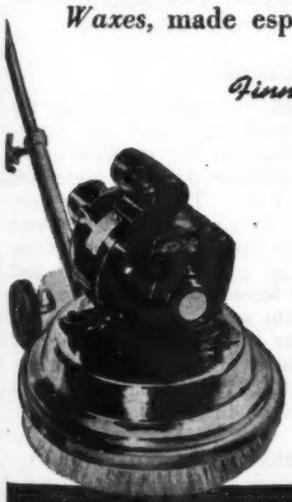
Pursuant to an agreement made between WMC and the Department of Labor, inspectors of the Wage-Hour Division will make inspections of employers' compliance with WMC regulations including the 48 Work-Week Order. There will be specific inspections for the sole purpose of gathering information for WMC, and concurrent inspections in which compliance with WMC will be checked as a sideline to the regular inspections by the Wage-Hour Division. No specific inspection will take place without employer consent; however, those denying such inspection will be reported to WMC.

Held Under the Act

A non-exempt employee who fills the place of an exempt executive employee in the latter's absence for a full work week is deemed for that work week an exempt employee, provided he fulfills all other requirements for an executive provided by the Act. If, however, he substitutes for the executive in the middle of the work week, he is

Meet the Finnell Family of WAXES

It's a large, service-minded family, including as it does every requisite type of floor wax—put up in quantities that best serve the individual needs of all users, from the smallest to the largest. All *Finnell* Waxes, both Spirit and Water types, are processed in *Finnell's own laboratories*—assuring consistently dependable quality throughout the line. And that quality is the same today as before the war, for *Finnell* Waxes still are available in their original formulae containing genuine wear-resisting Carnauba Wax. The greater genuine wax content of these prime products actually *seals* the floor surface with a tough, non-skid film. For maximum protection and minimum maintenance, choose *Finnell-Processed Waxes*, made especially for heavy traffic areas.



Finnell-Processed SPIRIT WAXES	*Finnell-Processed* WATER WAXES
Finnell-Kote, A Solid Wax	Fino-Gloss Standard
Finnell Liquid Kote	Fino-Gloss Water-Resisting
Finnell Cream Kote	Fino-Gloss Waterproof
Finnell Paste Wax	Fino-Gloss Non-Skid
Finnell Liquid Wax	Fino-Gloss Concentrate
. . . . *Also*	
Sanax Wax Cleaner (Leaves thin, non-skid wax film)	Solarbrite Scrub Soap (Safely removes wax)

To give an example of the wide range of quantities in which *Finnell* Waxes are put up, *Finnell Liquid Kote* comes in 1, 5, 30, and 55-gallon containers. For consultation or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2504 East Street, Elkhart, Indiana.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

RITCO

Special

MACHINE WORK

TO YOUR BLUEPRINT

RITCO's complete machine shop facilities and modern testing equipment assure quality and accuracy in every part produced. We are well equipped by these facilities and more than a century's experience in metal working to help you with your postwar planning and products. Estimates gladly submitted.

Shown at left: Special monel metal shaft, 2" diam., 20" long, produced for the Warren Steam Pump Company, Inc.

Remember RITCO *for*

SPECIAL BOLTS,
NUTS AND STUDS
DROP FORGING & DIE SINKING
HEAT TREATING
SPRAYED METAL SERVICE
PARKERIZING
CENTERLESS GRINDING

Catalog on request.

RHODE ISLAND TOOL COMPANY

148 West River St. Providence 1, R. I.

Serving American Industry Since 1834

not exempt, since the regulations stipulate that he must be employed in an executive capacity from the start of the work week. (Ruling of Wage-Hour Administrator)

A refrigerator salesman who serviced refrigerator parts of trucks which were used to ship ice cream in interstate commerce. The court declared that the main task of such employees was to insure the preservation of the goods transported and not to preserve the safety of the carrier. (Colbeck vs. Dairyland Creamery Company, S. Dak. Sup. Ct.)

Held Not Under the Act

Employees who solicit repair work, collect the articles to be repaired in trucks, transfer it to the repair shop, and later redeliver it to the customer, since such employees do not come within the salesmen exemption of the Act, inasmuch as they are not engaged in making sales but rather in rendering a service. (Ruling of Wage-Hour Administrator)

Exemption Under Wage-Hour Law

A state supreme court held that an employee engaged in supervising the unloading and disposition of outgoing freight came within the motor carrier exemption of the Wage-Hour Law. The test applied is whether or not a substantial portion of the employee's job affects safety. (Levinson vs. Spector Motor Service, Ill. Sup. Ct.)

Overtime Plan

Because its employees were to work over 40 hours a week, a company set up a lump sum overtime plan whereby $5 to $20 per month was given to each employee whether or not overtime was worked. The employees averaged from 42 to 43 hours a week. The Wage-Hour Division held the lump sum payment (paid regardless of overtime) to be part of the employees' straight time pay for determining their regular rates of pay in computing overtime compensation.

Overtime Records

Private records of overtime kept by the employee himself were held not acceptable as evidence in the employee's suit for alleged overtime due him under the Wage-Hour Law. The employee contended that the employer's records were so kept as to conceal hours of overtime worked. The court pointed out that since these records were for the employee's benefit solely, and could be used to refresh the employee's memory before giving testimony, they were not admissible as evidence. (Jackson vs. Pioneer Adhesive Works, Inc., N. J. Sup. Ct.)

Jobbers Liable for Manufacturers' Overtime

Jobbers who ship "hot goods" in interstate commerce were held liable for overtime due to their contractor's employees and for court costs, even though they had no actual knowledge of the contractor's violation of the law.

(*Continued on page* 198)

LINCOLN

Single Line

CENTRO-MATIC LUBRICATING SYSTEMS

The trolley unit of a heavy-duty overhead crane, illustrated at left, is equipped with a Lincoln Centro-Matic System. All bearings on this trolley unit are safely and easily lubricated from the catwalk by means of a hand-operated Lincoln Lubricant Pump.

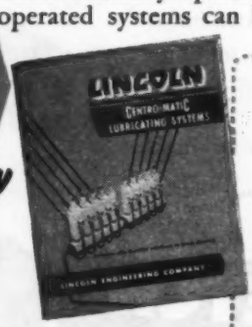
Save BEARINGS MACHINE HOURS MAN HOURS POWER and Prevent Accidents

Reduce Industrial Hazards

Industrial accidents frequently occur to workmen lubricating grease fittings placed in hazardous locations. This is especially true on the trolleys of heavy cranes operating over high runways. When cranes are equipped with Lincoln Centro-Matic Lubricating Systems this danger is reduced to a minimum.

These systems also eliminate "skipped bearings" because a Centro-Matic Injector is provided for each individual bearing, assuring the delivery of a measured amount of lubricant to all bearings every time the Centro-Matic Lubricant Pump is operated.

Lincoln Centro-Matic Lubricating Systems are single-line systems, and can be applied to all types of machinery and equipment that require lubrication. They are simple to install and are furnished with either manually-operated or power-operated lubricant pumps. Power-operated systems can be time-clock or push-button controlled.



Send for this Bulletin Today

Complete bulletin describing the Lincoln Centro-Matic Systems will be sent to you upon request. The coupon at right will bring your copy. If you have a special lubrication problem, write us, enclosing a blue print or specifications of the machine you wish to lubricate and our engineers will gladly make a recommendation. No obligation.

I WOULD LIKE TO HAVE FREE BULLETIN
On Lincoln Single Line Centro-Matic Lubricating Systems

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

P 8256

ARMY E NAVY

LINCOLN ENGINEERING COMPANY

Pioneer Builders of Engineered Lubricating Equipment

5701 NATURAL BRIDGE AVE., ST. LOUIS 20, MO., U. S. A.

LINCOLN

Your Parts Marking
MADE EASY, FAST,
Economical and Legible

LECTROETCH
ELECTROLYTIC
STENCIL ETCHING PROCESS

The Lectroetch Electrolytic Bench Unit is one of the most popular parts marking units on the market due to its speed in marking, (a matter of seconds), its absolute legibility, and the ease in which it can be handled.

There are two kinds of stencils used, the embossed, which can be made on a typewriter and is used for short runs; and the heavy-duty, long-life, engraved plastic stencils, which will clearly mark tens of thousands of parts, under ordinary conditions.

Bench Model is ideal for marking flat, cylindrical and odd-shaped parts, can be operated manually, or automatically, and will not interfere with surface tolerances. No acids used, no heat, shock, or strain. Inexpensive plastic locating fixture acts as a register guide, assuring consistent, uniform register of all markings.

Send for more detailed information.

The LECTROETCH Company
1727 DOAN AVENUE • • CLEVELAND 12, OHIO

WAR LABOR BOARD

* *Guide Rate Principles*

WLB, in pointing out the differences between guide and going wage rates, noted that the former are approximately average rates paid for a certain job in a labor market area, and are especially instrumental in correcting intraplant inequities where uniform base rates have been set for the industry, and where the use of going wage rates as a criterion would upset intraplant wage relationships. On the other hand, going wage rates approximate a level of 10 percent below the weighted average rate paid for a certain job in the area.

The board set forth these principles:

1. Inequities within a plant may properly be corrected on the basis of job rates paid by other plants in the industry when such comparisons are made in terms of differentials between the pay for one job and the pay for another.

2. The board's power to correct intraplant inequities by the use of such interplant comparisons is not limited by going rate principles.

3. When practically all plants in an industry in a given area pay the same rate to one occupation, such as common labor, the rates generally paid for other jobs constitute appropriate guides to be used in correcting intraplant inequities and, therefore, are known as guide rates.

4. The use of such guide rates is more appropriate than the use of going rates when, as in the lumber industry, virtually all plants have a uniform basic minimum rate.

5. Guide rates are not mandatory rates but are considered along with such other factors as historical differentials within the plant in question.

* *Substandard Wages to 55 Cents an Hour Approved*

While wage rates in many industries are still below the 50-cent minimum standard, WLB (as a result of the Lever dispute) authorizes regional war labor boards to approve wage rates up to 55 cents an hour in voluntary wage adjustment cases, irrespective of lower bracket rates. In dispute cases, however, the boards may take into consideration appropriate prevailing rates above or below the 55-cent-an-hour level. If any adjustment made under this resolution is to be used as a basis for price relief, or to increase production costs above those of comparable plants, approval of the wage adjustments must be made by the Economic Stabilization Director. (Resolution of NWLB)

Wage Adjustments

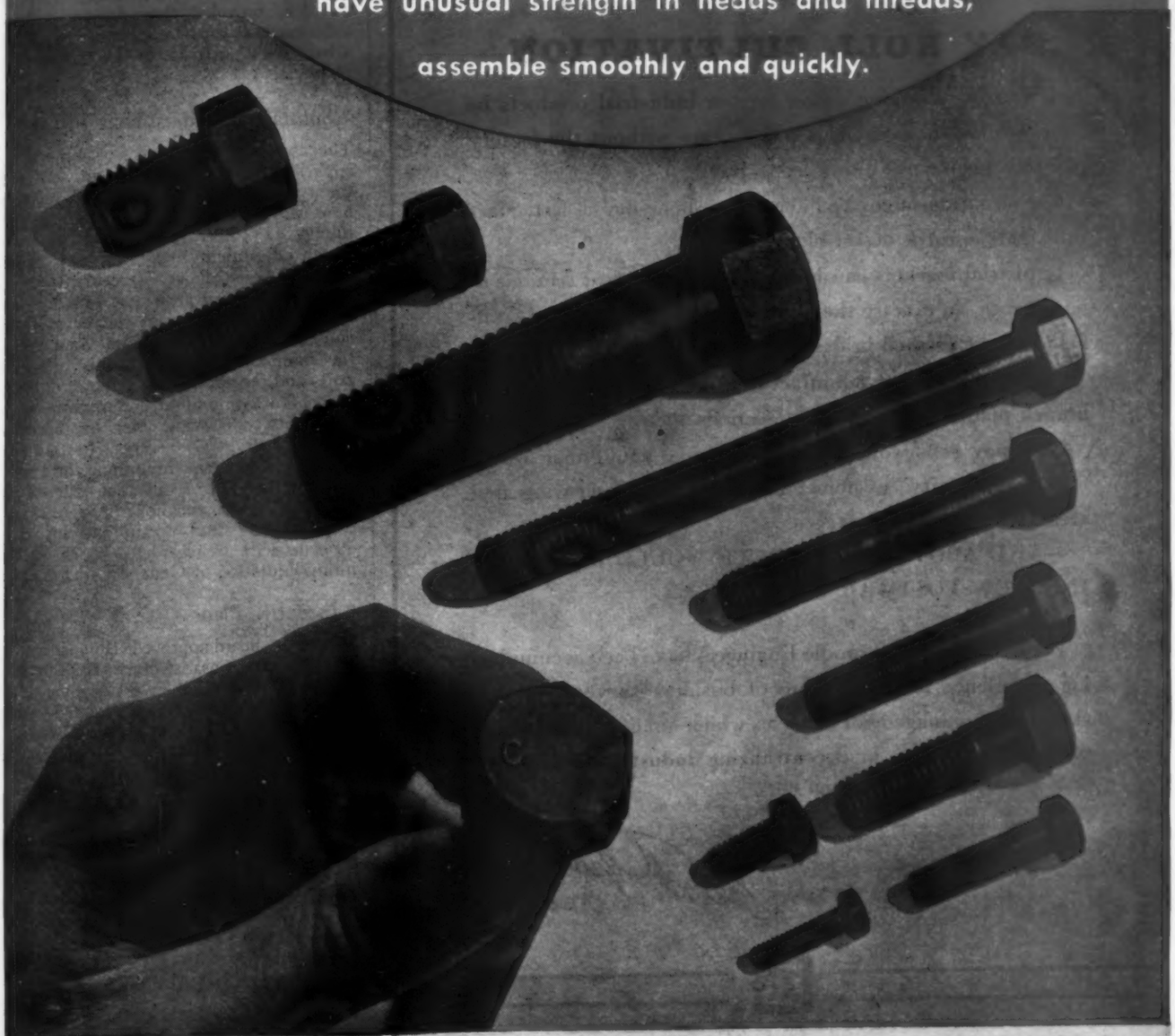
WLB may now order wage adjustments on vacations, shift differentials, merit increases, automatic progressions and reclas-

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

It's good business to use the best cap screws you can buy—for speed in the shop and strength in your finished product.

CLEVELAND *Top Quality* SAE 1035 CAP SCREWS

have unusual strength in heads and threads, assemble smoothly and quickly.



CLEVELAND *Top Quality* **FASTENERS**

The Cleveland Cap Screw Company

2917 EAST 79TH STREET • CLEVELAND 4, OHIO

Warehouses: Chicago, Philadelphia, New York, Los Angeles

Ask your Jobber for Cleveland Fasteners

MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY

PAY ROLL CULTIVATION

How can mass buying power for our industrial products be developed in the coming postwar years without the factory pay rolls people need in order to buy?

The situation might be likened to a bone-dry desert. Start to irrigate and the desert blooms.

Industrial markets can be created in backward sections of our country in exactly the same way that orchards and cornfields can be created in deserts by irrigation.

If well-established manufacturers of consumer goods put branch plants in poor market sections then—

New pay rolls would be created there; young men would find "opportunity" at home; there would be fewer congested areas and housing shortages.

—AND ABOVE ALL ELSE, WE WOULD BE CREATING NEW POSTWAR MARKETS.

★ ★ ★

For over 25 years Trundle Engineers have been accumulating experience in the making of business surveys, market studies and management analyses which qualify them to offer valuable assistance in decentralizing industrial operations.

Geo. A. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Brings to Industry and Business

26 Years **OF MANAGEMENT ENGINEERING EXPERIENCE**

GENERAL OFFICES • CLEVELAND • BULKLEY BUILDING

CHICAGO
City National Bank Bldg., 208 S. La Salle St.

NEW YORK
Graybar Bldg., 420 Lexington Ave.

sifications, and job re-evaluations without first determining whether a price adjustment is necessary. The board, however, is limited in making adjustments to: (1) One week for one year and two weeks for five years for vacations awards; (2) 4 cents an hour for second shift and 8 cents an hour for third shift in non-continuous operations for shift awards; (3) the board's present standards for merit awards; (4) a 1-cent-an-hour or 1 percent average increase for all employees in the plant for reclassification and job re-evaluation awards. The board, however, may exceed this limitation in rare and unusual cases. In view of this recent directive, fringe increases not mentioned above may be awarded, provided they do not appreciably increase production costs or furnish a basis for an increase in the existing level of prices.

* *Substandard Adjustment*

The above ruling is still not universal in application. WLB has recently clarified the types of adjustments to 50 cents an hour which may be made without board ruling: (1) Board approval is necessary for an adjustment that brings any part of the rate range above 50 cents an hour; (2) board approval is not necessary for raising the minimum of the range up to and including 50 cents an hour where the minimum of the range is below 50 cents and the maximum is above 50 cents; (3) if both minimum and maximum are below 50 cents, same may be raised up to and including 50 cents; (4) an employer who has the minimums of one or more of his job classification rate ranges below 50 cents per hour may hire new employees at rates up to and including 50 cents without regard to the 25 percent hiring limitation of General Order No. 31.

* *Incentive Plan*

Where a board-approved time incentive plan proved unsatisfactory to the employees, and resulted in a slow-up in production because of unpredicted labor shortages, RWLB ordered its dissolution. Because of this shortage in workers, piecerate workers had to do additional work usually performed by auxiliary service employees, thereby causing them to lose production time. The previously used piecework incentive system was ordered revived until a new time incentive system could be negotiated by the company and the union. (American Brake Shoe Corporation, RWLB-III)

* *Incentive Plan Altered*

Rather than eliminate a faulty wage incentive plan, WLB ordered the alteration of the existing plan by changing payment from a weekly to daily basis, re-examining time and motion studies on which the incentive pay was based, simplifying payroll forms, setting piece rates with union representatives, and other minor changes. The board held that the plan should be retained in the interests of war production, since it was requisite for the maintenance of the level of production. It also adopted the regional hearing officer's

These war-time days when you rely

On quick and accurate steel supply;

Of all the words in prose or rhyme,

None are more vital than . . . ON TIME!

LEVINSON STEEL

LEVINSON STEEL SALES CO.

33 PRIDE STREET • PITTSBURGH, PA.

LSS-1

HOFFMAN NO. 8C TRAP

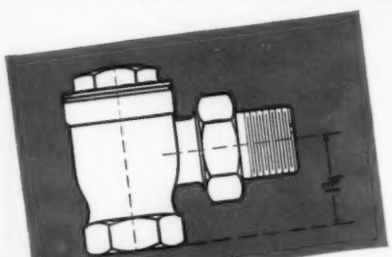
Six-diaphragm thermal element. ¾" connections made in angle and straightway patterns. Max. operating pressure 25 lbs. Capacity 400 sq. ft. EDR.

Heating and power plant operators have so far cheerfully made the best of equipment built of war-dictated materials. Now, with relaxed restrictions on brass, Hoffman again offers a complete line of low pressure, medium pressure and high pressure brass traps.

Hoffman Nos. 8C, 9C and 17C Traps are the three low pressure units being added now . . . *with body, nut and tailpiece of highest quality brass!* Note the Thermal Element, with special alloy Pin and non-corroding alloy Diaphragms . . . capable of giving long service under countless flexings and high temperatures. The entire Thermal Assembly is renewable and so is the Seat.

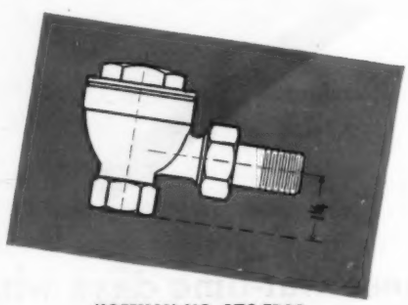
For *better* service *longer,* it's always good judgment to select steam specialties which can be quickly renovated when necessary. Hoffman Traps measure up to this standard—their renewable parts permit them to be economically maintained at full efficiency for many years.

Engineering data on Hoffman Valves, Traps and Pumps will be sent to you upon request.



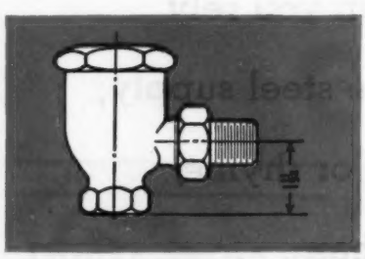
HOFFMAN NO. 9C TRAP

Thermal element has six diaphragms. 1" connections made in angle pattern only. Max. operating pressure 25 lbs. Capacity 700 sq. ft. EDR.



HOFFMAN NO. 17C TRAP

Thermal element consists of four diaphragms. ½" connections made in angle, straightway, R.H., L.H. patterns. Max. operating pressure 15 lbs. Capacity 200 sq. ft. EDR.



HOFFMAN NOS. 8 AND 9 TRAPS

Six-diaphragm thermal elements. No. 8 made in ½" x ½" angle and straightway, ⅜" angle only patterns. No. 9, ¾" x ¾", or 1" x 1", angle only. Max. operating pressure 50 lbs. Capacities on application.

HOFFMAN

VALVES • TRAPS • PUMPS

HOFFMAN SPECIALTY CO., 1001 YORK ST., DEPT. FM-6, INDIANAPOLIS 7, IND.

Makers of Valves, Traps, Vacuum and Condensation Pumps, Forced Hot Water Heating Systems . . . Sold by leading wholesalers of Heating and Plumbing equipment.

conclusion that the board would not order a new incentive plan opposed by unions, nor would it abolish an established plan unless it was proved unworkable. (Standard Register Company, WLB)

* *Insurance Plan Ordered*

Twenty-one companies were ordered by a RWLB to set up a death and disability insurance plan in accordance with a uniform plan found to cover 75 percent of the unionized employees of the industry, and written into their collective bargaining contracts. The board indicated that it derived the power to fix such terms and conditions of employment in labor agreements from the War Labor Disputes Act. (RWLB-I)

Discontinuance of Bonus Permitted

RWLB allowed a company to discontinue its quarterly profit-sharing bonus plan, in effect for eight years, where the company proved the existence of a serious financial condition as evidenced by lower 1944 earnings, impending obligations under a board retroactive wage order, uncertainties of contract renegotiations, absence of cost-plus contracts, etc. The decision was based on a determination that the bonus was not an integral part of the wage structure, and that the suspension or withdrawal did not constitute a wage decrease. (Atlantic Foundry Company, RWLB-V)

* *Shift Premiums*

Despite a custom in the plant to the contrary, a RWLB awarded shift premiums to second and third shifts in accordance with the doctrine laid down in the Basic Steel decision. Because the company had engaged in continuous production since 1902 without shift differentials, the board granted premiums smaller than was area practice. (Bird & Son, Inc., RWLB-I)

* *RWLB Orders Time and One-Half*

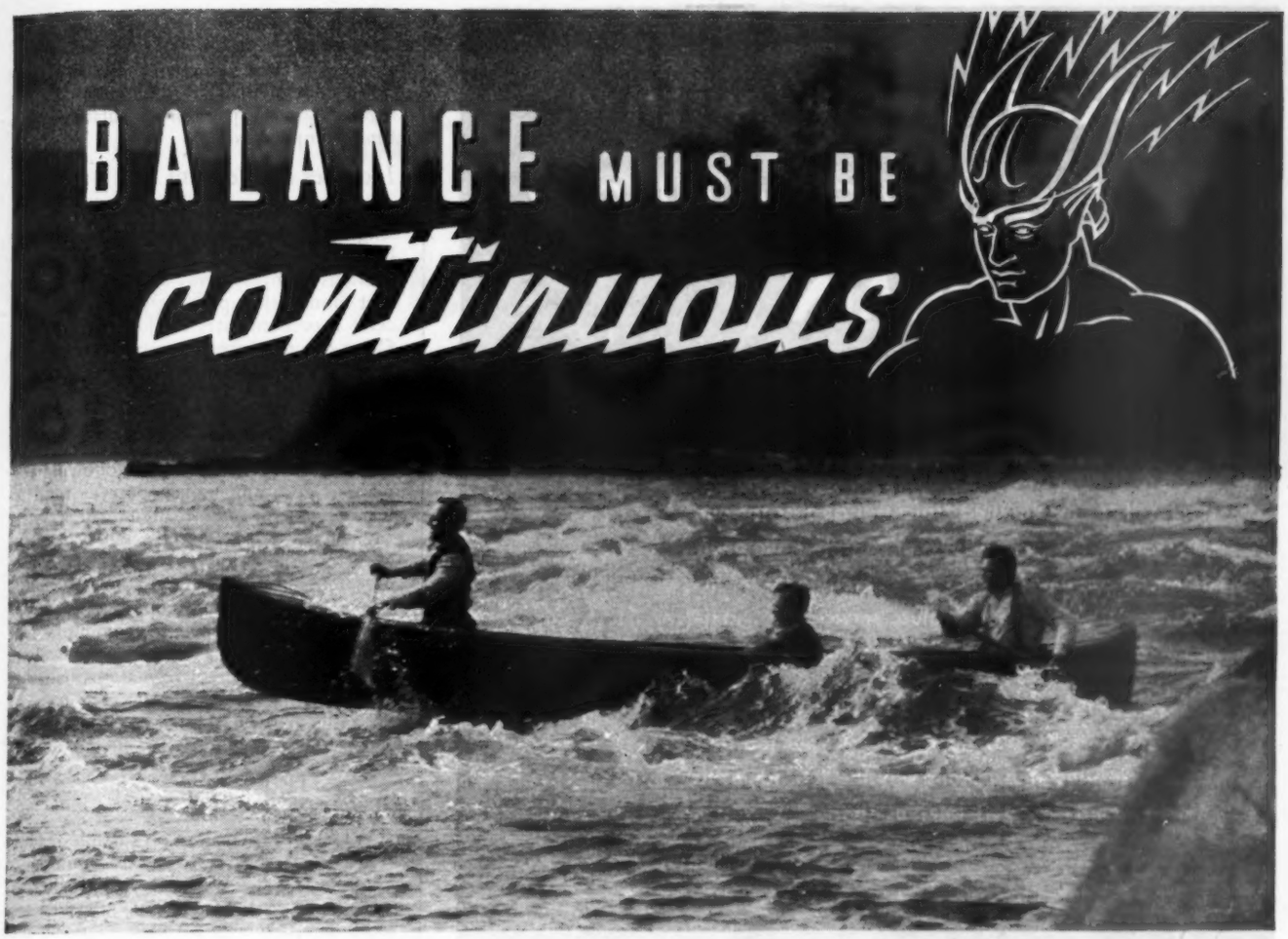
Despite the fact that a cotton-seed processor was specifically exempt from the Wage-Hour Law, a RWLB, in conformance with industry-area practice, directed it to pay time and one-half for work done in excess of 48 hours a week. The board contended that it derived the power to order such a directive from the War Labor Disputes Act—i.e., to settle all issues subject to collective bargaining. (Greenville Oil Works, RWLB-IV)

* *Retroactive Increase*

A wage increase based on going wage rates was made retroactive to the date of the expiration of the prior contract, despite the fact that the going wage rates had not been made effective until two years after the expiration of the contract. The board held that determination of retroactivity is distinct from the establishment of going rates and one does not bear upon the other in this situation. (Pal Blade Company, RWLB-II)

* *Shift Bonuses*

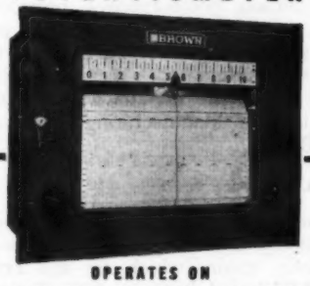
WLB, in correcting its ruling on shift bonuses, announced that it will abide by



IN CANOEING ··· IN PROCESS CONTROL

A NEW PRINCIPLE IN INSTRUMENTATION

BROWN *Electronik* POTENTIOMETER



OPERATES ON "CONTINUOUS BALANCE" PRINCIPLE

WHITE WATER! Shooting a rapids is hazardous sport demanding continuous coordination. There can be no relaxation — no loss of balance without instantaneous corrective action.

Industrial processing can be equally hazardous and costly. It warrants the application of the "last word" in measuring and controlling equipment.

That "last word" is the Brown ElectroniK Potentiometer—operating on the new "Continuous Balance" principle. A marvel of speed, sensitivity and accuracy, it is capable of supplying the instantaneous corrective action so necessary to maximum productivity and quality in process control.

Reconversion problems will be many for the busy executive. Let Brown engineers help on those involving measurement and control. Just pick up the telephone — the country over . . . The Brown Instrument Co., 4461 Wayne Avenue, Philadelphia 44, Pennsylvania.

Offices in all principal cities. 117 Peter Street, Toronto, Canada; Wadsworth Road, Perivale, Middlesex, England; Nybrokajen 7, Stockholm, Sweden.

INSTRUMENTS BY **BROWN** CONTROLS BY

MINNEAPOLIS **Honeywell**

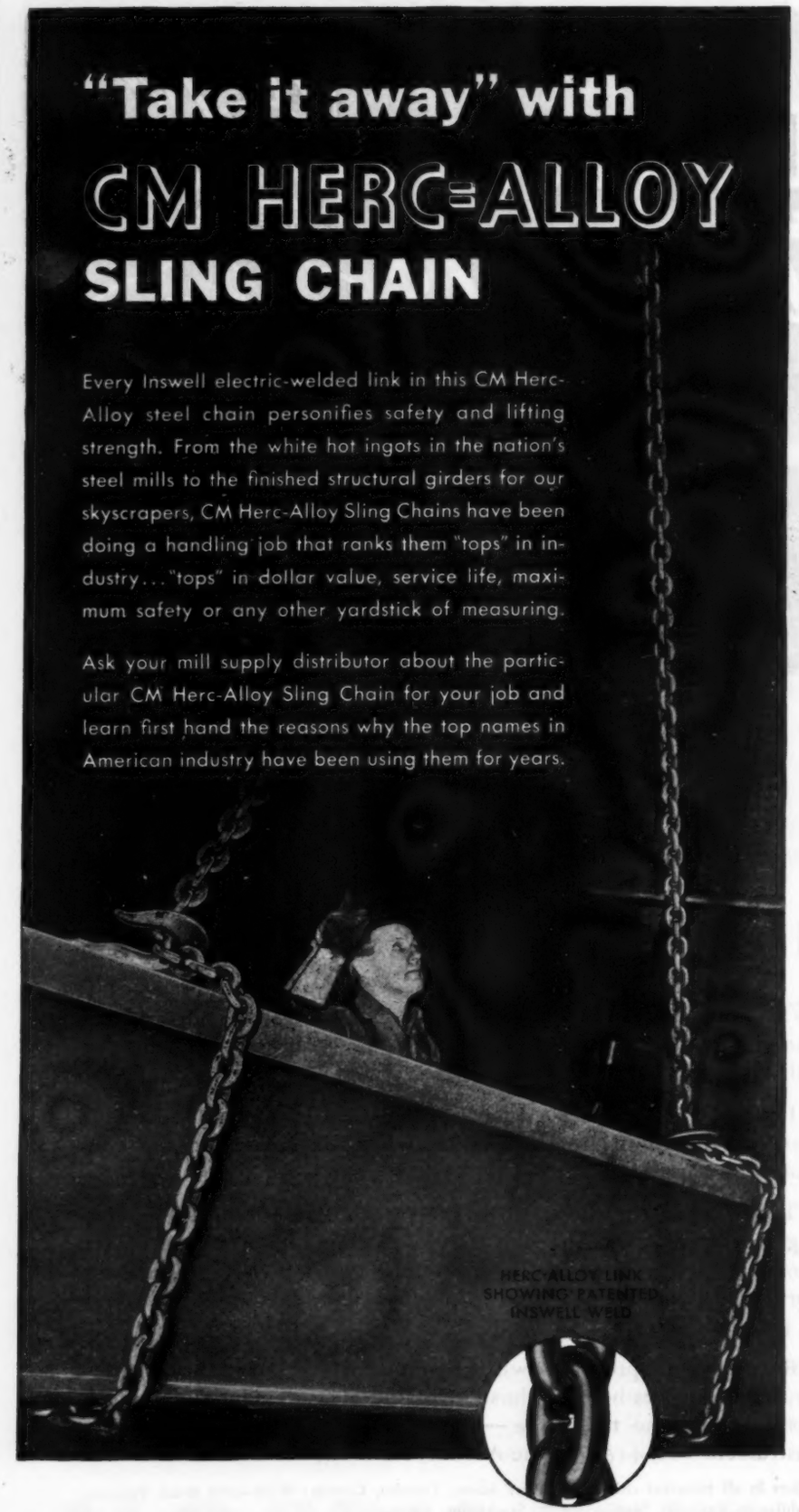
"Take it away" with

CM HERC-ALLOY

SLING CHAIN

Every Inswell electric-welded link in this CM Herc-Alloy steel chain personifies safety and lifting strength. From the white hot ingots in the nation's steel mills to the finished structural girders for our skyscrapers, CM Herc-Alloy Sling Chains have been doing a handling job that ranks them "tops" in industry... "tops" in dollar value, service life, maximum safety or any other yardstick of measuring.

Ask your mill supply distributor about the particular CM Herc-Alloy Sling Chain for your job and learn first hand the reasons why the top names in American industry have been using them for years.



COLUMBUS-McKINNON

CHAIN CORPORATION

(Affiliated with Chisholm-Moore Hoist Corporation)

GENERAL OFFICES AND FACTORIES: 130 Fremont Ave., TONAWANDA, N. Y.

SALES OFFICES: New York, Chicago and Cleveland

the Wage-Hour Law and Walsh-Healey Act by including shift differentials in the regular rate of pay for calculating overtime compensation.

Increases for Veterans

Reinstated veterans are entitled to all length-of-service increases they would have received had they continued in their previous employment. The contention that under this plan veterans would receive maximum rates for jobs without fulfilling the requisites for such increases was rejected. (Marmon-Harrington Company, WLB)

SSU Regulations Governing Veterans

SSU has recently issued the following regulations governing wages, bonuses, and reinstatement for men in the armed services: (1) Veterans may receive same payment as before induction provided it is not in excess of annual compensation previously paid; (2) bonuses to employees in armed services are limited to the amounts that could have been paid in accordance with the salary stabilization regulations had they remained in the employer's service; (3) veterans may be rehired without loss in seniority, status, or pay, or in jobs of like seniority, status, or pay.

Increase Granted

RWLB, denying a union's request for a wage increase up to the minimums of shipbuilding brackets, awarded smaller increases, up to the minimums, of steel fabrication brackets to workers preparing prefabricated metal parts for shipyards. The board held that industry lines must be adhered to, despite the fact that they may have been originally set artificially. The company involved had been classified as a fabricating firm and so steel fabricating rates must be observed. (Western Pipe & Steel Company of California, RWLB-X)

* *Wage Rollback Ordered*

RWLB ordered the ladies' handbag industry to roll back wages paid in excess of going wage rates, or accept the consequences of violating the Economic Stabilization Act. While it grants that hearings will be held to determine whether the wage brackets need revision, RWLB refused to withhold the rollback until the brackets are determined, and directed that enforcement commence immediately. (RWLB-II)

Reconversion Wage Rates

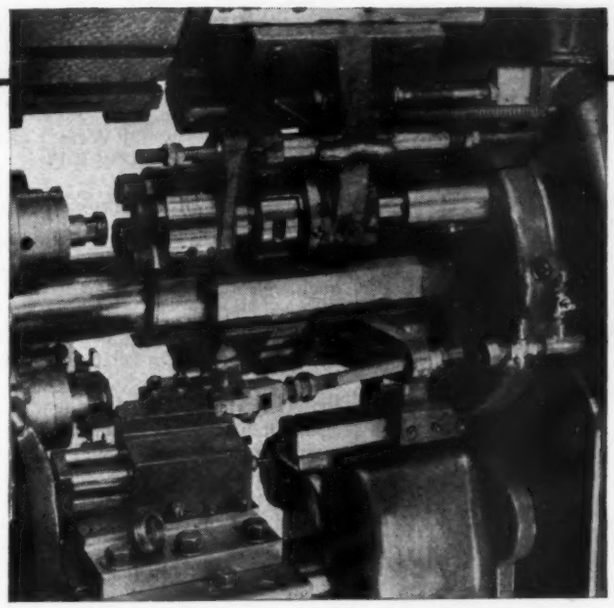
In converting from war to peacetime production, employees may be paid wartime rates without board approval, provided the job content of the war and peace jobs is substantially the same. This ruling will apply even where the wartime rates are higher than the pre-war wages. (Dunbar Furniture Manufacturing Company, WLB)

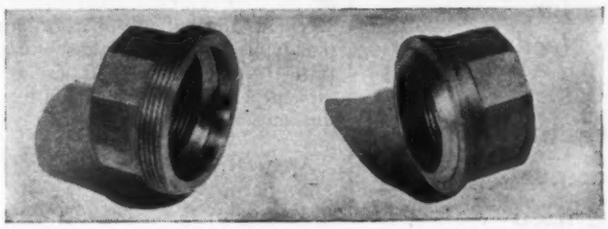
Lunch Pay

Despite the fact that a company had voluntarily initiated a paid lunch period for patriotic reasons which are still existent, RWLB denied its request to discontinue

If You Want to SELL MORE

GET YOUR COSTS DOWN

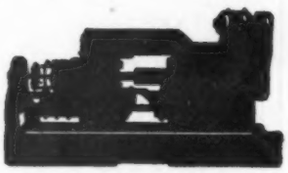




How one manufacturer saved over 50% in machine time

It is not a very complicated job to finish either part of this cast malleable iron pipe union. Each requires six tools—six separate machine operations. All six are done, at one time, on a four-spindle Acme-Gridley Chucking Machine—remarkably fast.

Acme-Gridleys are made for 4, 6 or 8 spindle operations for either bar or chucking work, in a wide range of sizes.



ACME-GRIDLEY
BAR and CHUCKING AUTOMATICS
maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

Good merchandisers have always known it—lower prices with sustained high quality broaden markets, because they make it possible for more people to buy.

And the more people buy, the lower production costs go.

That is the reason why sales managers and their salesmen are today interested in Acme-Gridley Automatics.

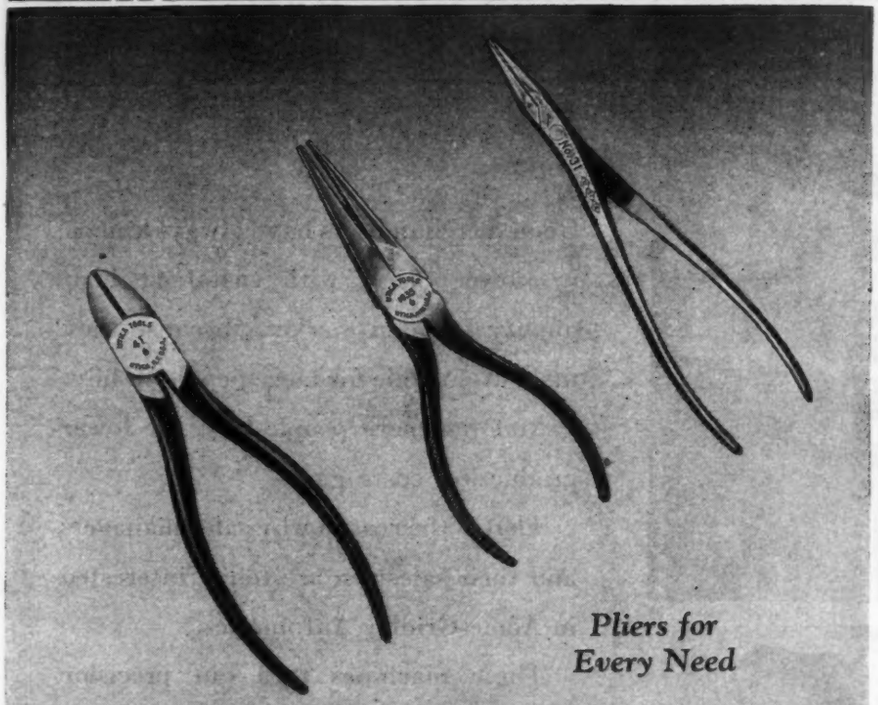
These machines turn out precision metal parts faster than they have ever been produced before. And because they save *time*, Acme-Gridleys reduce costs.

It's time now to take a good look at the sales value of automatic production machines, in preparation for the sales volume we shall need to keep America's expanded manufacturing plants busy enough to provide more jobs and make profits.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

UTICA
TOOLS
for More Tool Mileage



Pliers for Every Need

UTICA Pliers and Adjustable Wrenches offer ease of handling and long-life performance. Sold only through recognized distributors. After Victory, prompt shipments of UTICA Tools can again be made by your distributor.

★ BUY MORE WAR BONDS TODAY! ★

U TI CA
UTICA
DROP FORGE & TOOL
CORPORATION
UTICA, N.Y.

the lunch periods. On the other hand, where a paid lunch period had been instituted because of a three-shift arrangement which was discontinued because of lack of work, the board granted the company's request to eliminate the 20-min. paid lunch period. (U. S. Register Company, RWLB-XI; Duplex Printing Press Company, RWLB-XI)

* *Reduced Rate Requires Union Approval*

Employers may not compensate handicapped employees at lower rates than accorded other workers unless the union agrees to the lower rate for handicapped employees. The company had been authorized by the Wage-Hour Administration to pay such employees less than the contract scale, but was ordered to revise its policy by a RWLB. (Keystone Lime Works, Inc., RWLB-IV)

Maintenance-of-Membership Denied

Despite the fact that a union observed the no-strike pledge, held reasonably frequent elections, and made fairly regular financial reports (the three tests of responsibility), it was denied a maintenance-of-membership clause by the Daily Newspaper Commission on the ground that it made additional demands on management in excess of the terms of its contract. The union was found to have failed in its responsibility for the maintenance of the contract because of its attempts to expand the agreement, after it had been signed, to include provisions that had not been agreed to, because of its repudiation of an agreement that had been proposed by its own representatives and had been accepted, and because of its additional demands in excess of the terms of the contract. (New York Herald Tribune, Daily Newspaper Printing & Publishing Commission)

* *Application Without Union Signature*

Because a newly certified union failed to file charges of an unfair labor practice within three months after the company refused to bargain with it, the contract which the employer had renewed with another unon was held binding. Pursuant to the provision of the renewed contract calling for the right to process a Form 10 application, WLB deviated from its policy of refusing to process such forms for wage adjustments without the certified union's signature. (Dossin's Food Products, Inc., RWLB-XI)

* *Contract in Violation of Stabilization*

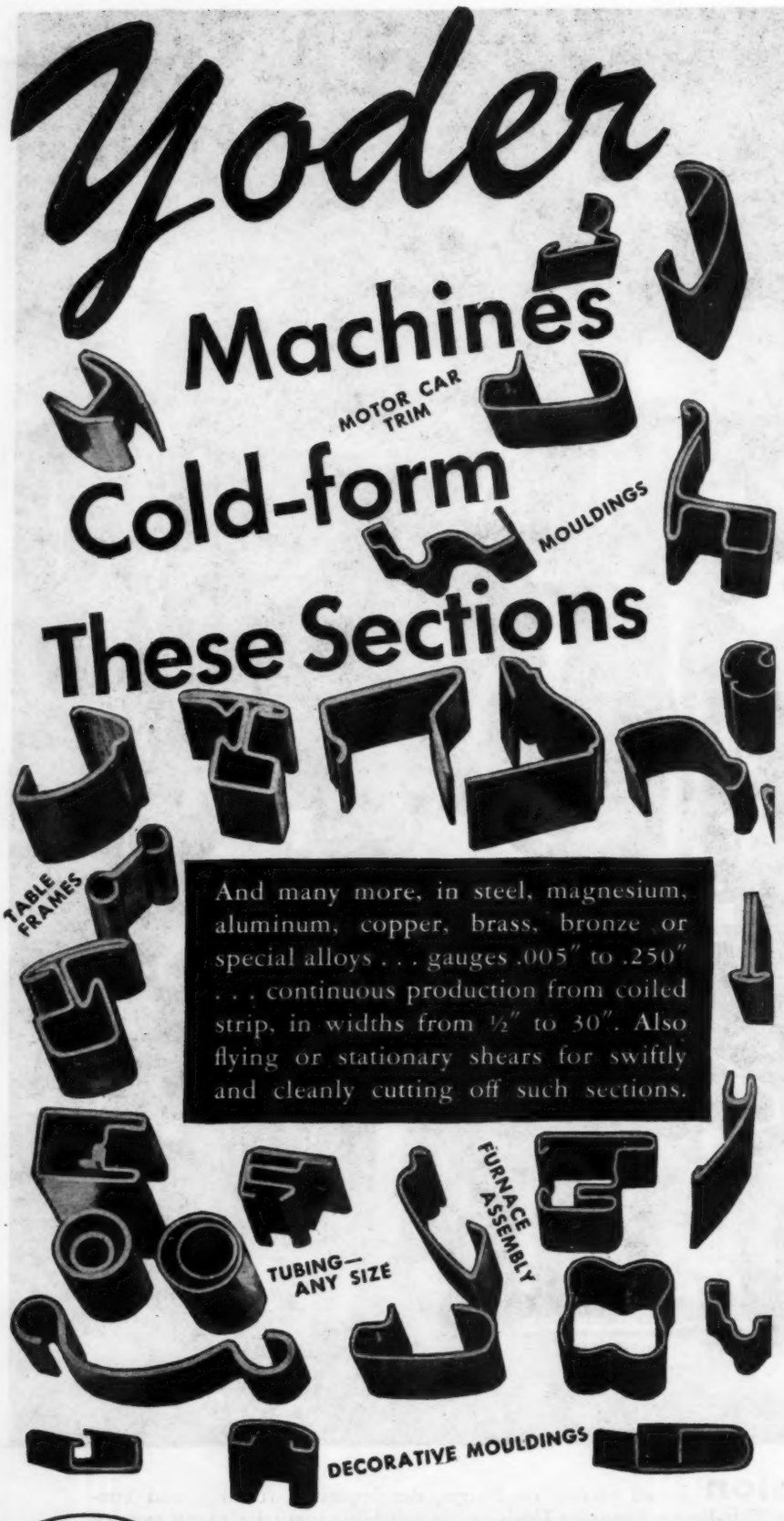
A suit for overtime due under the Wage-Hour Law was dismissed because the employment contract provided for wages in excess of those allowed under stabilization. Since the contract was illegal, the court held it not only unenforceable, but also void. (Wernhardt vs. Koenig, USDC E. Pa.)

* *Arbitration Ordered*

A RWLB refused to handle a dispute case over individual grievances although

T-P means Top Precision in all phases of design, development, tooling, and contract manufacturing. Here, in the Taft-Peirce Contract Division, is available virtually every type of machine tool, every element of personal skill and experience, which could be required on mechanical production problems by any manufacturer in any field of industry. If you need only a single tool or part, Taft-Peirce Contract Service will readily supply it. If you need complete mechanisms or machines in quantity lots, Taft-Peirce Contract Service will meet *your* production schedules and the most critical probing of *your* own inspectors. If you would like to see exactly *how*, write to The Taft-Peirce Mfg. Co., Woonsocket, Rhode Island, for the illustrated brochure entitled:

Take it to Taft-Peirce


Yoder
Machines
MOTOR CAR TRIM
Cold-form
MOULDINGS
These Sections
TABLE FRAMES
And many more, in steel, magnesium, aluminum, copper, brass, bronze or special alloys . . . gauges .005" to .250" . . . continuous production from coiled strip, in widths from ½" to 30". Also flying or stationary shears for swiftly and cleanly cutting off such sections.
FURNACE ASSEMBLY
TUBING—ANY SIZE
DECORATIVE MOULDINGS
ENGINEERING
YODER
MANUFACTURING
The YODER COMPANY
METAL WORKING PRODUCTION MACHINERY
5524 Walworth Ave. • Cleveland 2, Ohio

the parties involved had agreed that the grievance should be settled by the board. The board pointed out that the parties could not confer jurisdiction upon it, but rather that it would, itself, determine when it would exercise its jurisdiction. The parties involved were ordered to arbitrate the matter. (Stockham Pipe & Fittings Company, RWLB-IV)

* *Unenforcible Contract*

The New York Supreme Court ruled against an employee who brought suit to recover a wage increase which, although in violation of the Wage Stabilization Act, had been promised by his employer. The court explained that any agreement to raise wages illegally was unenforcible since to do otherwise would be to sanction a criminal offense. (Kells vs. Boutress, N. Y. Sup. Ct., Spec. Term, Pt. III)

* *Stabilization Violators*

The Director of Economic Stabilization ordered the cancellation of government contracts and withdrawal of priorities from a company which refused to comply with WLB orders. The order was based on WLB's jurisdiction to report non-compliance cases to the Director of Economic Stabilization, who was empowered to issue directives such as this to other government agencies.

NATIONAL LABOR RELATIONS BOARD

Militarized Guards Not Employees

A circuit court of appeals, in reversing NLRB, held that employers need not bargain with units of militarized plant guards, since they are not "employees" within the meaning of the National Labor Relations Act. The court stated that even if they were considered employees, bargaining relations would be contrary to public welfare because of their obligation to the federal government which hired, fired, and directed them. (NLRB vs. E. C. Atkins & Co., CCA-7).

* *Employer Liable for Representations of Foremen*

An employer was found in violation of Wagner Act because of the anti-union conduct of his foremen. Although the latter were in the bargaining unit, pursuant to industry practice, the employer was held liable for their conduct because he led the employees to believe that the foremen spoke for the management in their denunciation of the union. (R. R. Donnelly & Sons, NLRB)

* *Declaratory Judgment Denied*

Management has no right to procure an advance judgment on its proposed course of action before an employee election. In one case the employer sought approval of

Smooth Sharp Edges

FOR CEMENTED CARBIDE TOOLS

Bay State provides top grinding performance for your cemented carbide tools because

1. Fractional Grades—
   3 grades within a grade, more accurately "fitting grade to grind."
2. Controlled Porosity—
   scientific control of wheel structure.
3. Consistent Duplication.

For grinding cemented carbide tools, you want sharpening wheels that are cool and fast-cutting, produce keen edges and have long life. Bay State's Green Grit Wheels meet these requirements fully.

KOOLPORE, Bay State's very open and porous Green Grit Wheel, is highly recommended by users for rapid grinding of the cemented carbides.

Make a trial of Bay State Green Grit regular structure and Koolpore types. For any grinding wheel need, remember Bay State's exclusive methods of duplicating original specifications. Write for recommendations for your needs or contact the Bay State distributor, warehouse, or field engineer in your area.

BAY STATE ABRASIVE PRODUCTS CO.
5 Union Street, Westboro, Mass.

BAY STATE
ABRASIVE PRODUCTS
Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS · MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

ROSS
FOR THE
BIG JOBS
LIFT THAT LOAD
AS A UNIT . . AT LESS COST!
Consider your own handling problems. Are your heavy or bulky materials being lifted, loaded, tiered or unloaded by hand—piece by piece? . . . or perhaps by methods limited to certain fixed positions? If so, here is an opportunity to make a drastic reduction in overhead expense. With Ross Heavy Duty Lift-Trucks, materials are handled in unit-loads at costs which defy comparison. Several sizes and capacities to choose from. Write today for Bulletin F-45
ROSS . . for the Big Jobs
The ROSS CARRIER COMPANY, Benton Harbor, Michigan
Branches: Seattle - San Francisco - Vancouver, B.C. - New York City - Hoboken, N.J. - Portland
ROSS
HEAVY DUTY MATERIALS-HANDLING EQUIPMENT
BENTON HARBOR • MICHIGAN

his conduct in discussing union matters with his employees, and in soliciting statements from employees who did not wish to join the union that such was their attitude. The board held that it would not, at that stage in a representation proceeding, voice its opinion as to the conduct of the employer. (Hi-Alloy Castings Company, NLRB)

Representation Proceeding Not Barred

Continuance of a contract, by order of the WLB, does not bar a representation proceeding prompted by a petition of a rival union, since the contract as continued was for an indefinite duration. (Chicago Hardware Foundry Company, NLRB)

Election Ordered

The existence of an open-end contract, terminable at any time on 30 days' notice, was held to be free of the limitation on redetermination of the bargaining agent that a year-to-year contract imposes. Rejecting the union's contention that custom and an oral arrangement had changed the contract to a yearly one, the board directed an election to take place. (Westinghouse Electric & Manufacturing Company, NLRB)

* *Reinstatement With Back Pay Ordered*

Discharge of an employee upon the union's demand (pursuant to the latter's closed shop contract), on the ground that the employee was actively supporting the rival union, was held to be a discriminatory discharge. The employee, in compliance with the maintenance-of-membership requirement of the contract, was a member in good standing of the contracting union at the time of his discharge. NLRB explained that only failure to be a member of the contracting union could be justifiable ground for discharge under the closed-shop provision of the Act. (Federal Engineering Company, NLRB)

* *Reinstatement Denied*

Reinstatement was denied a veteran who accompanied his request for reemployment with a request for an indefinite leave of absence because of a physical ailment. Upon being informed that the union contract only provided for a definite period of leave, he then requested a release to look for another job. At a later date, he again sought reinstatement on the ground that he had made a timely application. The court, although it declared the physical ailment not to be a bar to reinstatement, upheld the employer's denial of reinstatement on the ground that the veteran had not made his application within the statutory time limit. (Grasso vs. Crowhurst, USDC N. J.)

An employee, purportedly discharged for filing a wage suit against the employer, was denied reinstatement on the ground that without the employer's permission he took his time card and that of another employee and was absent from work supposedly to look for another position. Also considered by the court was the fact that,

INCREASE PRODUCTION *by Reducing Fatigue . . .*

Ritter ADJUSTABLE SWIVEL STOOL

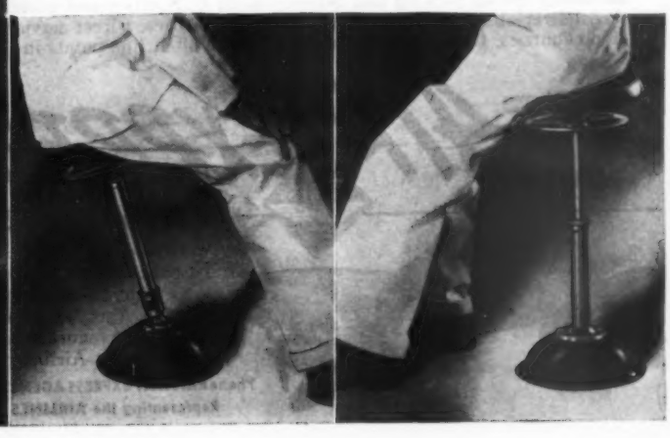
TILT THE STOOL IN ANY DIRECTION . . . FRONT OR BACK, LEFT OR RIGHT

RAISE OR LOWER TO DESIRED HEIGHT . . . 24 TO 31 INCHES

No Effort at all . . .

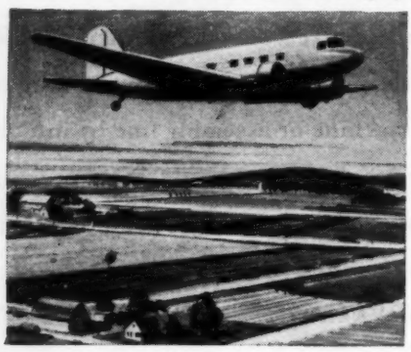
When workers are comfortable they can do better work, produce more. Eliminate fatigue at bench, machine or assembly line by installing Ritter Stools. Swivel base feature permits wide range and flexibility of movement. Finger-tip pressure instantly adjusts height. Built to last! *Ritter Company, Inc., Ritter Park, Rochester, N. Y.*

Ritter

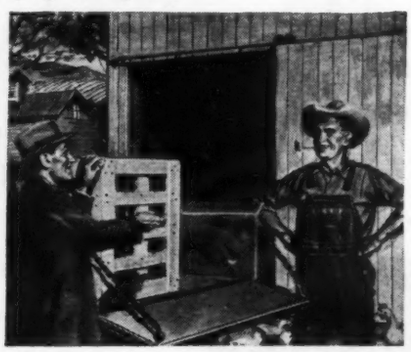


Gets Pump by Air Express: Dealer Saves Money, Cows get Water

WATER PUMP on Wisconsin dairy farm breaks down. The owner gives his local dealer a hurry-up call. Dealer promises quick delivery even though pump must come from Cleveland. (He has it in the morning by specifying Air Express.)



DEALER ABSORBS Air Express charges but, even so, he figures a saving of money — because the pump is a high-priced, slow-turn unit that he cannot afford to stock. (With Air Express the nation's inventory is within hours of your business.)



THOUSANDS of businessmen find this fastest delivery a real economy — *a real money-maker* — when a customer wants something not in stock. (Yes, with Air Express, you give high-speed service on high-priced items without cost of stocking.)

Specify Air Express — Low Cost for High Speed

25 lbs., for instance, travels more than 500 miles for $4.38, more than 1,000 miles for $8.75, more than 2,000 miles for $17.50, at a speed of three miles a minute — with cost including special pick-up and delivery in all U. S. cities and principal towns. Same-day delivery between many airport towns and cities. Direct service to scores of foreign countries. Rapid air-rail service to 23,000 off-airline points in the United States.

AIR EXPRESS

AIR EXPRESS

GETS THERE FIRST

Write Today for "Quizzical Quizz", a booklet packed with facts that will help you solve many a shipping problem. Railway Express Agency, Air Express Division, 230 Park Avenue, New York 17. Or ask for it at any Airline or Express office.

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION

Representing the AIRLINES of the United States

LABOR DEVELOPMENTS (*continued*)

since his discharge, the employee had incurred physical disabilities, thus preventing him from performing the work of his former job. (Walling vs. Barnesville Farmers Elevator, USDC Minn.)

Injunction Denied

California Supreme Court denied union member an injunction to restrain officers of the union from using union funds collected by assessment on members for the support of certain political candidates in a state election. The court held that the use of the funds for such purposes was not against public policy or the laws of California, nor was such action violative of the right of suffrage. (Warner vs. Screen Office Employees Guild, Calif. Sup. Ct.)

* *Held Unfair Labor Practice*

A letter, expressing the employer's anti-union views, sent to employees in the armed forces was held to violate the Wagner Act, since the employee in the armed service is still an employee of the company, and present workers of the employer had learned of it. (Shartle Brothers Machine Company, NLRB)

* *Held Not Coercion*

Distribution of a letter from a company to its employees stating the benefits enjoyed without a union, and that, although the employees' status would not be affected by their attitude toward the union, it believed there was no need for a union, was held not to be coercive. On the other hand, the action of a foreman of this same company, who in addition to making statements similar to those in the letter also implied that the benefits might be forfeited if the union won, was held to be coercive. (Big Lake Oil Co. v. NLRB, CCA-5)

Held Discrimination

The results of an employee election were set aside because the employer allowed one union to electioneer on company property and denied the representatives of the rival union, who were non-employees, access to the property. The board held that the employer should have given equal opportunity to both unions to electioneer, or should have denied the facilities to both. (Crosley Corporation, NLRB)

* *Held Domination*

Despite the fact that the employer had not promoted or controlled the union, the latter was held to be dominated because of the employer's opposition to a rival union, and other actions which interfered with unfettered choice of employees.

In the same case, the board's order of reinstatement with back pay for an employee convicted of assault and battery was reversed by the court, since the board refused reinstatement to an employee who was convicted of malicious destruction of a non-striker's property. The court held that no difference could be drawn between the acts of these two workers to warrant different treatment. (NLRB vs. Mt. Clemens Pottery Company, CCA-6)

DOW CORNING

SILICONES

DOW CORNING, first in silicones, is fully equipped with new plant and facilities for the production and distribution of an expanding line of silicone products

American industry has been quick to utilize the new Dow Corning Silicones—to see the potentialities inherent in their higher order of heat stability, chemical inertness, water resistance, and dielectric properties. Dow Corning is now supplying, directly or through selected distributors, the following silicone products:

FLUIDS Water-white, odorless, inert Silicone Liquids . . . notable for their low rate of viscosity change over a wide temperature range, low vapor pressure, water repellency, and good dielectric properties.

4 Ignition Sealing Compound . . . an easily applied silicone waterproofing compound having excellent dielectric properties, corona resistance, and the consistency of petroleum jelly. It neither hardens nor melts at temperatures ranging from −40° F. to 400° F.

7 Special Low Temperature Compound . . . an oxidation resistant lubricant and sealing compound developed for use at temperatures as low as −70° F.

31 A lubricating Silicone Grease for special applications in the temperature range of −70° F. to 190° F.

41 A lubricating Silicone Grease for special applications where operating temperatures range from 0° F. to 400° F.

993 Insulating Varnish . . . recommended because of its extreme heat stability for impregnating, coating and bonding, and waterproofing inorganic insulating materials such as asbestos, mica, and Fiberglas cloth, tape, and sleeving. Other special purpose silicone resins and compounds are available.

STOPCOCK GREASE A chemically resistant Silicone Grease for lubricating stopcocks and other ground glass joints.

PLUG COCK GREASE A Silicone Grease that affords easy operation of lubricated plug valves over wide temperature ranges in most difficult services.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
ADDRESS ALL INQUIRIES TO BOX 592

Dow Corning
FIRST IN SILICONES

Now you can fasten V-Belts by using . . . .

ALLIGATOR

TRADE MARK REG. U.S. PAT. OFFICE

V-BELT FASTENERS

• **Alligator V-belt Fasteners and the open-end V-belting now being made by belting manufacturers, will enable you to make up multiple V-belt drives from roll belting. These fasteners have been on the market 9 years and are now being used on a wide variety of drives.**

Available for B, C, D sizes of belt for industrial use and 1-in. and 2-in. sizes for railroad use. These fasteners, however, should not be used for repairing endless cord V-belts.

Bulletin V-205 will give you complete details as to where and how these fasteners are used, sizes, list prices, tools and application instructions. A copy will be mailed at your request.

Order from your supply house

FLEXIBLE STEEL LACING CO.
4678 Lexington Street, Chicago 44, Illinois

Also sole manufacturers of Alligator Steel Belt Lacing for flat transmission belts and Flexco HD Belt Fasteners and Rip Plates for fastening and repairing conveyor belts.

THEY SAY AND DO

How to Keep Foremen From Joining Unions

F. J. BURNS MORTON, Works Manager, A. E. Hawley & Co., Ltd., England

Both in America, where foremanship problems have had widespread attention for the past quarter of a century, and in Great Britain, where the standards of supervision are just commencing to receive publicity, the foreman as part of management is an idea in theory rather than a fact in practice. As a general rule, foremen are not consulted; they are ordered.

There is no doubt that in the rapidly advancing social conditions of industry, the foreman, as a class, has been overlooked.

It might be said that foremen as a whole do not want to join trade unions, except as a last resort in order that their cause can be properly represented. It is only in a state of extreme exasperation that the foreman would consider strike action. This is particularly true in Great Britain, in spite of its long history of trade unionism with its present well-established position.

What steps should be taken to prevent foremen, in a temporary feeling of sheer desperation, adopting extreme measures and breaking with their traditional past? These may be summarized:

1. Insure a greater degree of collaboration between management and foremen, both in day-to-day contacts and in periodic conferences.

2. Keep foremen advised of all changes affecting them, especially in regard to labor. Issue a foreman's policy manual for his guidance.

3. Strengthen the foreman's status. Support him with operatives. Give orders through the foreman—not direct to workers. Do not allow functional departments to undermine his prestige. Raise his authority with employees.

4. Review existing salary scales so that individual anomalies might be removed.

5. Consider the introduction of a foreman's bonus based on departmental results. Keep him advised of all figures for control such as costs, output, labor turnover, absenteeism, etc.

6. Compare the foreman's benevolent privileges as to sickness, death, pensions, and so forth, with those enjoyed by operatives, from whatever source.

7. Encourage various means for raising the standard of supervision through foremen's associations, supervisors' discussion groups, ministry of labor courses, regional and national conferences, and visits to other works.

8. Insist on a higher standard of supervision, better qualifications, and more precise selection of foremen.

•

Cartels Are Threat to Economic Progress

J. HOWARD PEW, President, Sun Oil Company, New York, before the National Conference of Business Paper Editors

In recent years there have been various pressures undermining our competitive enterprise system and pushing us toward a collectivist system under ever-expanding governmental authority. I shall discuss tonight only one of these pressures, that of monopolistic restraints of trade. The widespread movement that recently has come to the front to cartelize world trade under government control through so-called "trade accords" is, in my opinion, the greatest danger now threatening economic progress in the United States. . .

Discussions of this sort mean very little unless we have before use a clear definition of the terms and words we are using, and a definite exposition of the principles upon which we make our stand. So, as a starting point, all that I say will be bottomed upon a strong and fervent faith in the superiority of our American competitive system as a means of raising the standard of living for all, providing employment for those able and willing to work, and creating opportunities for men and women to utilize their talents to the utmost.

Business and industry render their greatest service to the nation when they constantly produce better products and services at lower prices through an efficiency that reconciles a low-cost policy with the payment of high wages. But that objective can be realized only through constantly increasing the productive efficiency of everyone engaged in business and industry. It cannot be achieved under the restrictions of bureaucratic con-

What science has done

TO MAKE GOOD OILS BETTER

There is little need today to explain what additive treatment has done to improve nature's best petroleum products. Were it not for chemical discoveries in lubrication science, machines could not have served so long and faithfully in war production.

As a typical example of how lubricants can be "fortified" for their job, take Houghton's Sta-Puts. They're polymerized, giving them high adhesion to metals and great resistance to leakage. They're also given an extreme-pressure treatment which enables them to carry heavy loads without permitting metal-to-metal contact.

Because of its wider range of service, one grade of Sta-Put can replace two or more consistencies of untreated machine oils—and give more perfect lubrication. By requiring less oil, less often, the cost of lubricant and maintenance is reduced.

The use of Sta-Put Lubricants will help raise the efficiency of hand-oiled machines to that of totally enclosed, self-lubricated types. That's a strong statement, but we can back it up.

For the longer machine life you need so greatly after four years of war production, investigate Sta-Put Lubricants. The Houghton man can advise as to proper applications for those superior, "fortified" oils and greases. E. F. HOUGHTON & CO., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

STA-PUT LUBRICANTS

Houghton's FORTIFIED *Lubricants*

RUST is a ROBBER!

TECTYL *KEEPS IT OUT*

One Quick, Easy Precaution...

You take protective measures against theft of your valuable equipment or materials. Don't let *rust* ruin it right under your nose! You can STOP destructive corrosion by simply spraying, dipping, brushing, or flushing metal surfaces with Tectyl—it *seals* out moisture for as long as two years. Tectyl leaves a thin, transparent film; you can always see its protection. A little Tectyl covers a lot of metal, and comes off clean and quick with kerosene.

One of Five Specialized Types

will fit your special need—whether you're packaging for overseas shipment, laying up for reconversion, or fighting rust in plant operation. Tectyl protection is tested, proven, *positive*. Write today... tell us your own corrosion problem, and we'll send you a Tectyl bulletin with complete application data.

TECTYL
STOPS RUST

VALVOLINE OIL COMPANY

Finest Lubricating Oils Since 1866

455 Culvert Street Cincinnati 2, Ohio

Refinery at Butler, Pennsylvania General Offices, Cincinnati, Ohio

New York - Atlanta - Detroit - Chicago - Los Angeles - Vancouver - Washington, D.C.

trol; nor can it be achieved in the face of feather-bedding practices, whether imposed by government, labor, or the owners of industry; and it cannot be achieved if we are going to adopt policies that remove both the stimulus and the means to increased efficiency by reducing alike the rewards for seeking it and the penalities for ignoring it. . .

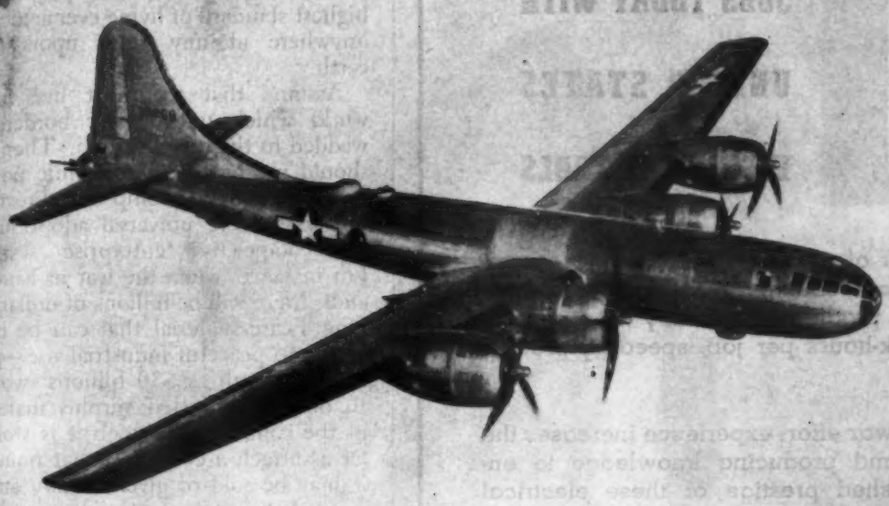
International trade and domestic trade are not two different things. They cannot be isolated in compartments, one from the other. They are parts of the same thing. This country cannot be cartelized in its foreign trade and free in its domestic enterprise, any more than a nation can survive "half free and half slave." Once we start to regiment through allocations, price fixing, and production controls our activities in the foreign field, we, of necessity, will have forced upon us by the government, restrictive measures upon operations falling wholly within the domestic field . . .

What may well be America's best record of "presenteeism" was recently finished, when death came to Herbert Van Wynen, 69-year-old bank-lock assembler at The Yale & Towne Manufacturing Company, Stamford, Conn. For more than 49 years Van Wynen had been at his bench every working day, and during that time he had never once been late. A record like that is something any firm can be proud of. Is there a worker who can beat it?

A healthy foreign trade is essential to our well-being as well as to that of the rest of the world. Our government should be vigilant in opening and preserving trade opportunities abroad for American business, and every effort, compatible with our national interest, should be made to expand world trade. Our volume of world trade, proportionately small as it has been, is of great importance to our economic life, particularly to those industries largely dependent upon export business. But this foreign trade is not worth the price, if that price is abandonment of our competitive enterprise system and placing our domestic economy in a totalitarian straitjacket.

Finally, we hear it said our partici-

SPEED NUTS OVER TOKYO



Boeing uses thousands of SPEED NUTS on every B-29 Superfortress to make them lighter, faster and deadlier.

Photos courtesy of Boeing Aircraft Company

SPEED NUTS HELP THESE BOEING WORKERS BOOST B-29 PRODUCTION

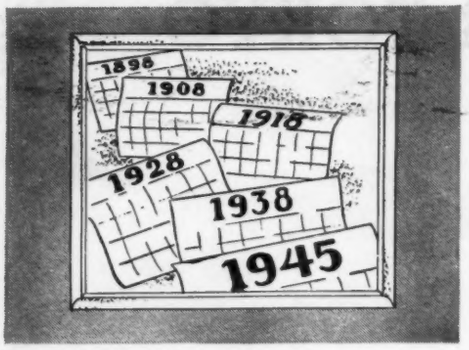
TINNERMAN PRODUCTS, INC.
2096 Fulton Road, Cleveland 13, Ohio

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario *In England:* Simmonds Aerocessories, Ltd., London

Speed Nuts PATENTED *Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

LET THE EXPERIENCE OF MANY YESTERDAYS



LIGHTEN YOUR JOBS TODAY WITH UNITED STATES ELECTRICAL TOOLS

The huge reservoir of electrical engineering experience, stored up in 47 years of experimenting, improving, perfecting, is tapped with prodigal generosity to give you tools today in cutting work-hours per job, speeding production, reducing costs.

At the same time, war effort experience increases the stockpile of engineering and producing knowledge to enhance the present established prestige of these electrical tools in the post-war world. Industry is finding UNITED STATES ELECTRICAL TOOLS exceptionally useful . . . your plant, too, can profit by them.

SWING FRAME GRINDER

Furnished complete with guards, belts and all attachments. Light, flexible, balanced rotatively and laterally. Ball bearing throughout. Perfect visibility. V-belt drive. Single suspension at center with balancing adjustment to compensate for wheel wear. Double suspension at wheel end and motor end. Can be tilted 45° to right and 80° to left.

PRECISION LATHE GRINDERS

Model XX

For internal or external grinding. Ball bearing grinding wheel spindles interchangeable on corresponding sizes. For use with lathe, planer, boring mill, milling machine, etc. Vertical or horizontal position. Spindles equipped with matched precision ball bearings in dustproof housings.

THE United States ELECTRICAL TOOL CO.
CINCINNATI 14, OHIO

pation in super-state cartels is inevitable. The argument goes that most of the world has embraced cartels and there is nothing that we can do about it. Thus we are urged to climb aboard the cartel bandwagon, even though it means the destruction of a system at home which has given our people the highest standard of living ever achieved anywhere at any time upon this earth. . .

Assume that we must live in a world which outside our borders is wedded to the cartel system. Then we should use our great economic power to give world leadership and direction toward a more universal adoption of the competitive enterprise system. For instance, when the war in Europe ends, there will be billions of dollars of Lend-Lease material that can be converted to peaceful industrial use—perhaps as much as $30 billions' worth. In disposing of that surplus material in the countries in which it is stored, let us attach a condition that none of it may be sold or given to any enterprise that is a party to any cartel arrangement. There have been suggestions in Congress that the surplus war material in this country should not be sold to monopolistic enterprises. There is no reason for any less exclusive requirement for the disposal of surplus material abroad. . .

Let us not be beguiled by emotional appeals and glittering promises, but let us rather give sober reflection to the *Wall Street Journal's* recent observation that "No people ever entered the compulsory state through a door on which the price of admission was plainly posted." Through the doors of super-state and government-controlled cartels lies the road that leads to nationalism, isolationism, totalitarianism, and finally, to another disastrous war.

•

Planning Now to Offset Shortage of Engineers

A shortage of men trained to engineer diesel engine construction, to service diesel engines, and to operate them is foreseen by the Diesel Engine Manufacturers Association. To offset this shortage the association is launching a program, in cooperation with schools of engineering in colleges and universities throughout the country, to train men for this field.

The industry has pledged its help to aid these schools in securing proper equipment and information about diesel engines to supplement the basic principles of mechanical engineering

"HOW ARE ROSS COOLERS DESIGNED TO MASTER *Any* HEAT REMOVAL PROBLEM?"

ROSS

"CP" & "BCF"

COOLERS

"All parts are standard, yet specially assembled to meet individual performance needs. The "CP" design is for larger cooling requirements, and the "BCF" for smaller. Both have exceptional provisions for easy maintenance, mounting in any position and diversified piping arrangements. The construction is strong and compact — requiring minimum space.

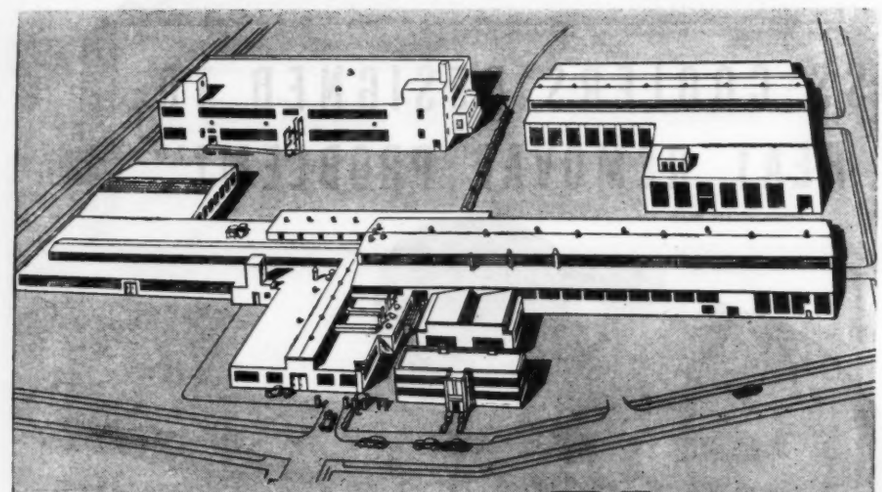
As a result of such flexibility, they are effectively used in a very broad list of services including: lubricating oil of engines, gears, turbines and machine tools; oil pump systems; cutting oil; quenching oil; transformer oil; hydraulic presses; engine jacket water; refrigerant emulsions; small vapor condensers; and wherever oil, water or other fluids are circulated for heat removal."

ROSS HEATER & MFG. CO., INC.

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

"CP" BULLETIN 5322
"BCF" BULLETIN 4922
Fully illustrated. Complete data on design features, sizes, materials and performance. WRITE FOR EITHER OR BOTH!

GENERAL OFFICES AND PLANT: 1427 WEST AVENUE, BUFFALO 13, N. Y.



Complete Plant Facilities

... another important reason why it pays to work with Ampco as your main source of bronze parts

The distinctive properties of Ampco Metal — its resistance to wear, impact, fatigue, and corrosion—its ability to last several times as long as ordinary bronze — are available to you in a form that fits your needs. This is true because Ampco is completely equipped to produce and work the metal by every commonly used process. By constant research and experimentation, Ampco has continually added new processes, giving results heretofore impossible with this particular material. Specify Ampco Metal with confidence that the Ampco organization can provide the engineering and production "know-how" and the specialized plant facilities to deliver the part you want.

Ampco Metal, Inc.
Dept. FM-4, Milwaukee 4, Wis.

AMPCO Metal
The Metal without an Equal

Ampco Field Offices in Principal Cities

● This new Ampco book — sent free to engineers and executives — may suggest additional improvements in bronze parts or a better way of fabricating them. Ask for it today.

A-9

which they are teaching at the present. The schools, in turn, have agreed to place diesel engineering, servicing, and operation on the same level as any other engineering skill.

It is the belief of the manufacturers and educators that returned servicemen who will re-enter college under the government's program of education will be especially interested in advantage of these courses

●

Get Students Ready for Industrial Life

EVERETT P. BALCH, President, Orange Screen Company, Maplewood, N. J., before the New York University School of Education

There is facing us today another problem which, when solved, will go far toward solving the labor-management problems of business and industry. I refer to the problem of adequate education. What I have to say is not a criticism of our school system. Our American public school system is outstanding and preeminent. I am not one who feels that it is all wrong and should be changed. On the contrary, I think it is all right, but can be improved. . .

Interviewing an employee who is leaving is now considered by industrialists as important as interviewing an applicant. The exit from school, and entrance into business, is an important transition which, in my opinion, has not received the careful, thorough treatment which has been given to the educational process up to the point of graduation.

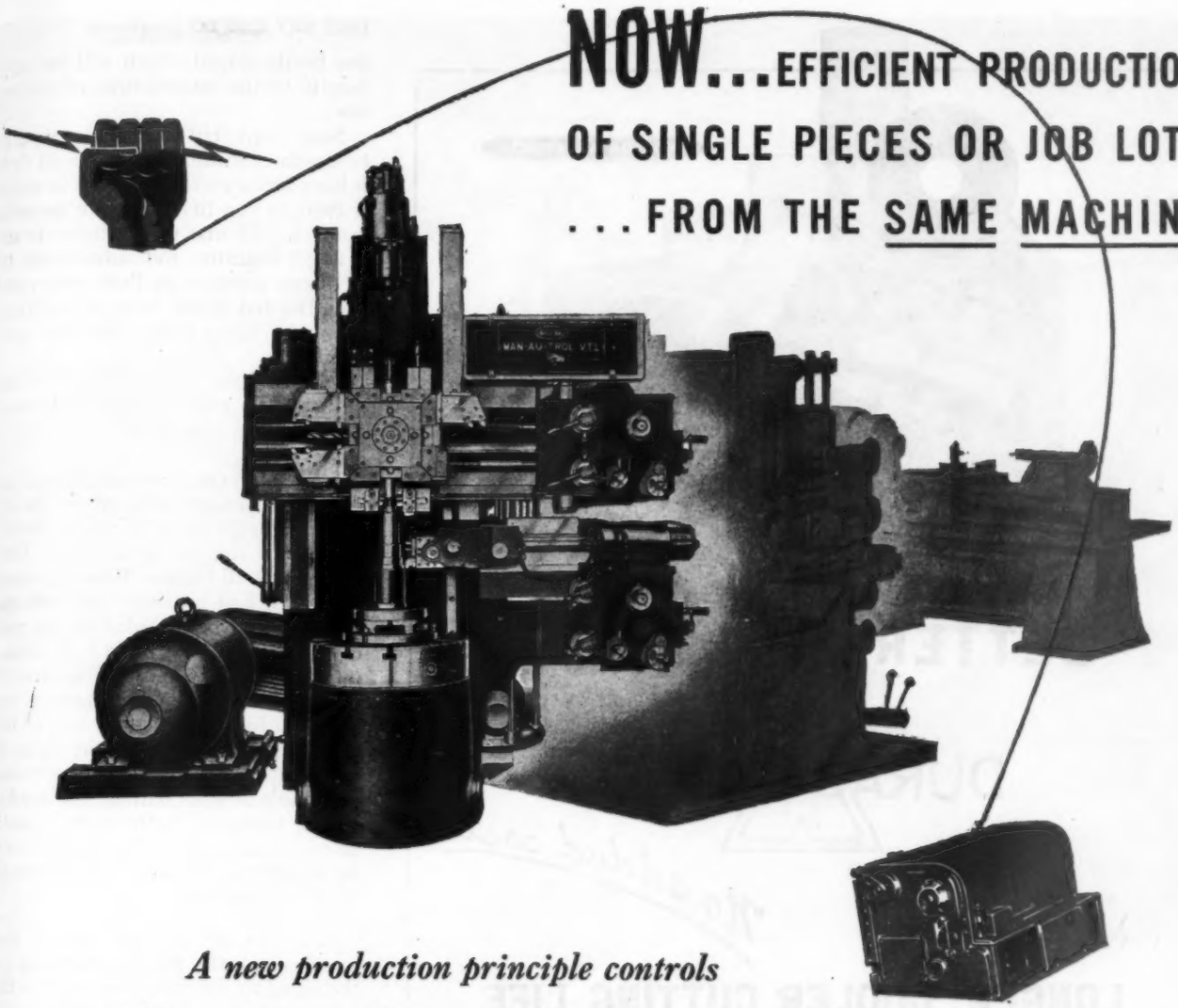
Planning for Future

Would it not be a very practical venture to have developed during the coming years a course of business training which would, to some extent give those students who are not going on to college a better opportunity to become versed in their jobs? In New Jersey over 90 percent of our youth do not go to college, and yet those who are high school students are given a college preparatory course. Some of the subject matter is not at all applicable to the work which they will later undertake.

Could not our system be modified to the more efficient plan of preparing this large percentage with more adequate training for their jobs, and preparing college students with additional college preparatory work thereafter?

I am firmly convinced that with the combined thinking of those in education and those in industry a program

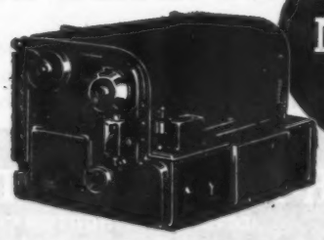
NOW...EFFICIENT PRODUCTION OF SINGLE PIECES OR JOB LOTS ...FROM THE SAME MACHINE



A new production principle controls a multi-purpose machine automatically or manually

The Bullard MAN-AU-TROL principle of automaticity gives to *one* multi-purpose machine the ability to produce one piece or many pieces with a degree of shop efficiency hitherto possible only from *two or more* different machines... Applied to a Vertical Turret Lathe, for example, MAN-AU-TROL automatically controls production of any part the machine is capable of turning out... in long or short runs. It cuts down setup time from one class of work to another. It allows instant conversion to manually-controlled production of entirely different parts without affecting the automatic setup of the production job.... This revolutionary mastery of the machine is achieved because the Bullard MAN-AU-TROL merely duplicates without human or cumulative error the mental and muscular functions performed by a manual operator, while the operator continues to supervise the production. It increases the inherent versatility of any machine of which it is a part. However, for the present, it is being applied only to Bullard machines. The Bullard Company, Bridgeport 2, Connecticut.

The automatic control that is as versatile as manual control



BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

100% automaticity... 100% versatility... no human or cumulative error... control to the closest tolerances... a tremendous cost advantage in competitive markets!

This New Mark means BETTER Metal Sanding

DURABONDED

QUALITY ABRASIVES

No added cost!

LONGER, COOLER CUTTING LIFE For Coated Abrasives

More resistant to heat . Less sensitive to humidity

DURABONDED is the result of Behr-Manning's new process for hardening the adhesive bond, to resist cutting heat, retard loading, repel humidity. Actual field reports on metal sanding operations using DURABONDED abrasives show a 25% average increase in cutting life—at no added cost. Have one of our Field Engineers show you how DURABONDED can help on *your* production.

Drop us a line on your letterhead, either to Troy or our nearest branch.

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma

BEHR-MANNING · TROY, N.Y.

(DIVISION OF NORTON COMPANY)

RELIABLE COATED ABRASIVES SINCE 1872

can be developed which will be very helpful to the businessmen of tomorrow. . .

Some have criticized this cooperation with education on the ground that it has ulterior motives. I wish to make it clear to you that there are no such motives. All that we are trying to do is to get educators and industrialists to sit down together in their own communities and decide what, if anything, they wish to do about their own programs. . .

I would like to see added to the curriculum a training that would have the following objectives:

1. A clear-cut, concise picture of American business as a whole, bringing to light its strength and weakness, not overlooking the gains which have come to us all because there are those who have had initiative and courage. There should be included in this part of the program some effort to inculcate into the minds of those future leaders of American business a surging enthusiasm for the American way of life as we know it, comparing the status of our citizens and our standard of living with those of other nations. There has been a tendency on the part of youth to take these matters for granted until faced with periods such as that through which we now pass.

2. A review of high ethical and moral standards, placing emphasis on the value to the individual and to the community accruing from the practice of these standards—character building on a paying basis.

3. A closer correlation between the vocational type of school and the scholastic type, so that a student can transfer from one course to the other as his talents indicate that he should. Part-time education should be available to take care of those who must leave school early. It is working now during wartime; why should it not be continued?

4. Systematic visits to all lines of business and industry within a reasonable area of the school, followed up by examination about the business and industry would be my conception of an excellent preview course. We have guidance programs which are helpful, but the student should have some opportunity of making his own selection of the thousands of jobs available. So much of the present program is theoretical and academic that I question whether the full benefits of directing students to the things for which they are best fitted are really obtained through the average guidance program of today.

IT TAKES "SAND" TO DO THIS WORK

You are looking at the "business end" of a sand suction line.

This one is operating in Lake Erie and pumps 600 tons of sand per hour.

This is hard, tough work . . . an acid test for hose stamina . . . and that is why Perfection Sand Suction Hose, embodying the "know-how" of 70 years of hose building, is the leader in its field.

For better service remember BWH "Built With Honor" industrial rubber products, and for more particulars please write us for the name of our nearest industrial distributor and field technician.

BOSTON WOVEN HOSE & RUBBER COMPANY

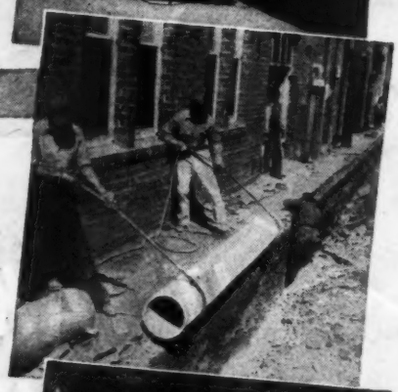
WORKS: CAMBRIDGE, MASS., U.S.A. P.O. BOX 1071, BOSTON 3, MASS., U.S.A.

1. BIGGER TRUCK LOADS

Right from the start, easy-to-handle Transite Pipe begins to pay off. Its lightweight means more footage carried per truck load . . . lower hauling costs.

2. SMALLER CREWS

On the job, it takes fewer men to handle Transite Pipe, and smaller installation crews mean lower installation costs. Mechanical handling equipment is not necessary except for larger sizes.



3. FASTER ASSEMBLY

In the trench, Transite Pipe is assembled easily, even by unskilled crews. Simplex Coupling assures tight, flexible joints. And they *stay* tight, even when the line is deflected as much as 5° at each joint.

* * *

And in service, Transite Pipe pays off in efficient, dependable water transportation over the years. Made of asbestos and cement, this non-metallic pipe is immune to tuberculation, highly resistant to soil corrosion.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

22 East 40th Street, New York 16, N. Y.

TRANSITE PIPE

FOR EFFICIENT, ECONOMICAL WATER TRANSPORTATION

BOOKS

THE ORIGINAL MANUAL FOR LABOR AND MANAGEMENT COMMITTEES

T. K. Quinn Co., Inc., 110 East 42nd St., New York. 238 pages. Tab indexed. Drawings. $5.

Published by T. K. Quinn, formerly Director General of the War Production Drive Division, WPB, on a non-profit basis (all income above costs to be donated to the American Red Cross), in the hope that after a post-war readjustment period the number of labor and management committees will tend to increase and their functions broaden. The Manual undertakes to document the technique and experience developed by the program from the beginning, and is planned to serve as a day-to-day working reference and informational guide. In looseleaf binder, to permit addition of later material. In 14 tab-indexed sections, including such subjects as "Suggestions," "Manpower," "Safety," "Music," "New Trends," "Industrial Viewpoints," "Post-War."

MANAGEMENT AT THE BARGAINING TABLE

Lee H. Hill, Vice-President, Allis-Chalmers Manufacturing Company, and Charles R. Hook, Jr., Secretary, Rustless Iron & Steel Corporation. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 300 pages. Charts, index. $3.

Written to give management and its representatives a fresh and broad viewpoint on the principles involved and the knowledge of agreements, their content, and the steps in negotiating them that will enable management to protect its authority and perform its managerial functions. In two parts—The Content of the Collective Bargaining Agreement; and Technique of Collective Bargaining.

EMPLOYEE COUNSELING

Nathaniel Cantor, Chairman, Department of Sociology and Anthropology, University of Buffalo. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 167 pages. Index. $2.

One of the "Industrial Organization and Management Series." Subtitled "A New Viewpoint in Industrial Psychology," book presents a definite social and psychological theory underlying employee counseling, and outlines the training, skills, and procedures needed by the personnel consultant to reach the real cause of employee dissatisfaction. Shows how to set up a workable employee counseling program in a small or large factory. In three parts—The Problem; The Approach; The Organization.

CONFERENCE LEADERSHIP IN BUSINESS AND INDUSTRY

Earle S. Hannaford, M.S., Supervisor of Training Practices, Long Lines Plant Department, American Telephone & Telegraph Co. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 289 pages. Charts, forms, quizzes, suggested exercises, index. $3.

One of the "Industrial Organization and Management Series." Provides a step-by-step procedure for conducting business conferences, and includes procedures for preparing conference material and guiding and shaping discussions, and suggested programs for training and development in conference leadership. Eighteen

new air drills FOR FASTER PRECISION DRILLING in screw machines

The entire time cycle in parts manufacture involving the precision drilling of small deep holes improves with the use of new Keller Pneumatic Screw Machine Drill.

Two tool-worthy characteristics mark the new drill—high speed and accuracy—and it offers advantages in driving standard twist drills in comparison with twist drills held stationary:

1. **Drilling speed can be increased by 1200 to 3500 rpm, of utmost advantage when drilling small deep holes on the larger type of screw machines where the spindle speed of the machine is too slow for satisfactory cutting speed.**

Holes drilled with the new tool will not "run out." The air drill spindle revolves in a direction opposite to the direction of the work in the screw machine spindle. The result . . . a true hole; minimum drill breakage.

Mounted in regular tool holders of automatic or hand screw machines, it is fed with compressed air through a very simple valve arrangement which opens automatically as the turret moves forward, closes when the turret is backed away from the work.

Available in 3 sizes and 12 models, with speeds of 1200, 2800, and 3500 rpm. Drill capacities range from 1/32″ to 3/8″ diameter twist drills. Higher speeds are available for drilling plastics and soft metals.

Send the coupon or write us for further details and prices. Here is another Keller Pneumatic Tool that does the job!

KELLER TOOL COMPANY
4504 Martin Street • Grand Haven, Michigan

KELLER
Pneumatic Tools

MAIL TODAY

Keller Tool Company
Grand Haven, Michigan

Please send data and prices regarding your new Pneumatic Screw Machine Drill.

Name _____

Company Name _____

Street Address _____

City _____ **State** _____

If you have a special drilling problem, tell us about it. Our engineers will give you specific recommendations.

A $1900.00 MACHINE
AND A $1.90 SAW BLADE

BUT

the SAW does
the cutting . . .
not the machine!

And MILFORD PROFILE SAW does it best! You can do contour or profile sawing on any vertical machine equipped with proper guides and speeds. But there is a world of difference in the saw you can use.

MILFORD PROFILE SAW is the product of a group of specialists who make nothing but metal cutting saw blades. It is made with painstaking care and the most modern equipment to do the best all-around cutting job that can be done . . . on any and all machines.

That's why you should specify MILFORD PROFILE SAW . . . and insist on getting it.

Now packed in an improved stronger box, from which the saw can be stripped free . . . no binding . . . no buckling.

Complete stock is carried by all MILFORD distributors in every industrial center from coast to coast . . . as near as your telephone.

THE HENRY G. THOMPSON & SON COMPANY
SAW SPECIALISTS EXCLUSIVELY FOR OVER 65 YEARS
NEW HAVEN 5, CONNECTICUT
Makers of Rezistor and Duplex Hack Saw Blades

chapters, including such titles as: "Conference Leading and Its Everyday Business Applications"; "Meetings and Conferences Defined"; "The Normal Thought Process and How We Learn"; "The General Conference Process"; "The Three Specific Conference Discussion Processes"; "Questions and Their Use in Conference Leading"; "Characteristics of Individuals as an Aid to Guiding Conference Discussions"; Desirable Traits and Characteristics of a Conference Leader"; "Conference Discussion Planning"; "Some Do's and Don'ts for the Leader."

BOOKLETS

HOW TO ESTABLISH AND MAINTAIN A PERSONNEL DEPARTMENT. AMA Research Report No. 4. American Management Association, 300 West 42nd St., New York 18. 114 pages. Forms, figures, bibliography, index. $2.25.

EMPLOYER RESPONSIBILITY FOR VETERAN REEMPLOYMENT. Manpower for the Final Blows; Industry's Responsibility for the War Veteran; Problems of Reemployment and Demobilization. Personnel Series No. 83. American Management Association, 330 West 42nd St., New York 18. 50 pages. 75c.

TEAMWORK AND LABOR TURNOVER in The Aircraft Industry of Southern California. Elton Mayo and George F. F. Lombard. Graduate School of Business Administration, Bureau of Business Research, Harvard University, Soldiers Field, Boston 63. 30 pages. Charts, tables. $1.

WAR CONTRACT TERMINATIONS AND SETTLEMENTS. Report by the director of contract settlement to the Congress, second report, January, 1945. U. S. Government Printing Office, Washington, D. C. 63 pages. No charge.

PUTTING THE DISABLED VETERAN BACK TO WORK, II. A panel discussion. Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 13. 33 pages. References. 25c.

HOW TO AVOID UNFAIR LABOR PRACTICES. The first of a series of special reports of collective bargaining techniques. Labor Relations Institute, 1776 Broadway, New York 19. 44 pages. $1 each for 1 to 100 copies; less in larger quantities.

IMPORTANT 1944 LABOR DECISIONS AND RULINGS, Supplement to the Labor Analyst. Labor Institute of America, 119 West 57th St., New York 19. 6 pages. No charge.

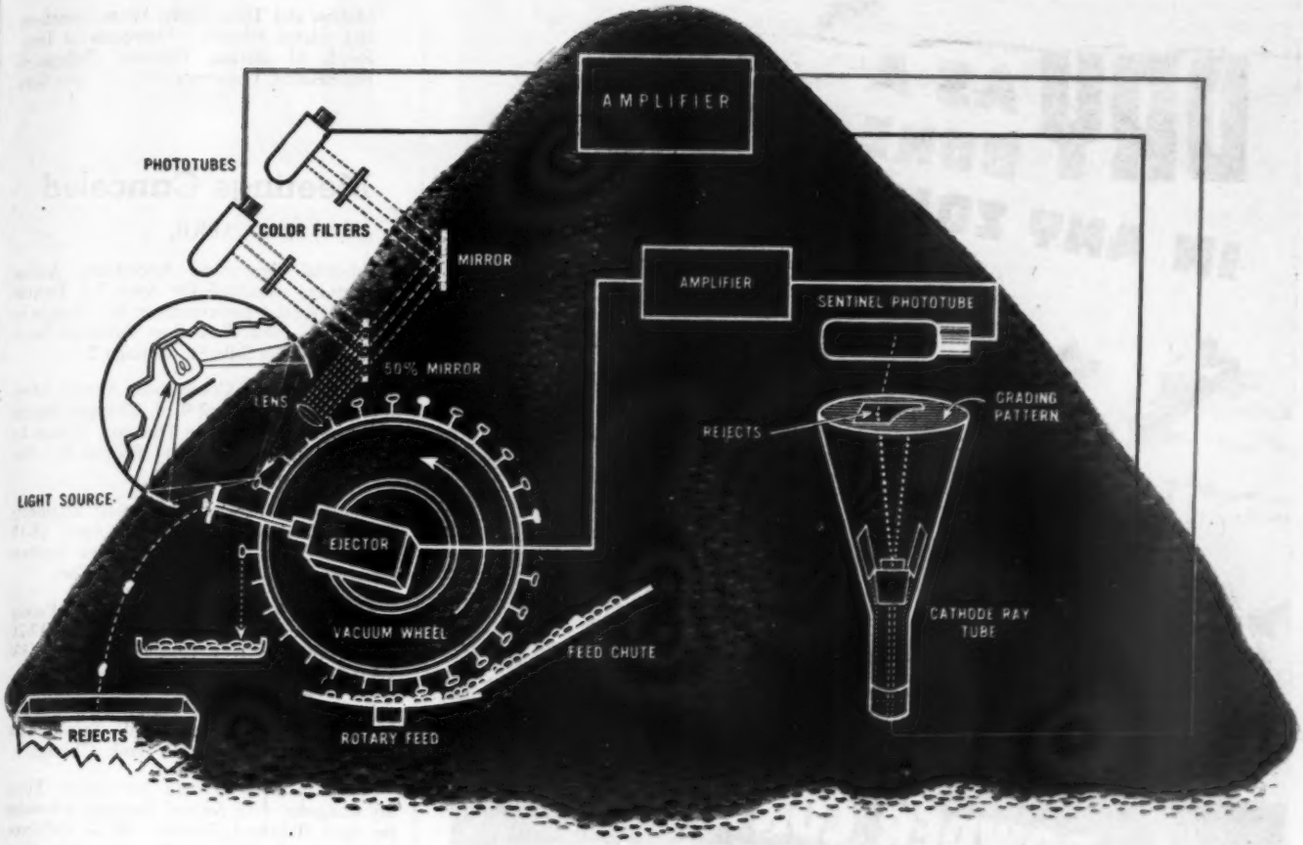
•

ON THE CALENDAR

UNIVERSITY SUMMER COURSES FOR EXECUTIVES AND ENGINEERS

JUNE

11–29, Summer Management Course devoted to Production Planning, Plant Layout,



How to sort a mountain of beans with RCA Electron Tubes

New Electronic device by Electric Sorting-Machine Co. color-sorts beans, corn, peanuts, coffee, and similar products — faster, better, more economically

AN electronic sorting-machine, developed by Electric Sorting-Machine Company, provides a fast, accurate method of color-sorting. In use throughout the country, this device is saving manpower and money and is speeding vital food-processing. Its ingenious principle is readily adaptable to a multitude of sorting problems.

How It Works: As each bean goes through the machine, it is illuminated by an incandescent lamp. Light reflected from the bean is picked up by two RCA phototubes, one sensitive to red light, the other, to green. The percentage of red and green light reflected from the bean determines its acceptance or rejection.

The output of each phototube is fed into dual-channel amplifiers and from there to opposite deflection electrodes of an RCA cathode-ray tube. The cathode-ray beam is deflected vertically and horizontally in proportion to percentage of red and green light picked up by phototubes.

A mask covers one area of the cathode-ray tube screen. The beam falls in this area when the percentage of red and green is acceptable. When the beam falls on the unmasked area of the screen, it means that the color is *not* acceptable. A "sentinel" phototube picks up the "off-color" signal and actuates a relay which rejects the faulty bean.

Turn to Electronics for Solution of Your Own Problems: For information on this equipment, write to Electric Sorting-Machine Company, Grand Rapids, Michigan.

Electron tubes are providing a practical solution to hundreds of diversified manufacturing problems—process-control, machine-control, heat-treating, plant-protection, and a host of others. Consult with RCA tube-application engineers for information or advice on use of electron tubes in the design of your own equipment. For examples of electronics at work in our own factories, send for the free booklet "Electrons in Action at RCA." Write to RCA, Commercial Engineering Section, Dept. 62-54L, Harrison, New Jersey.

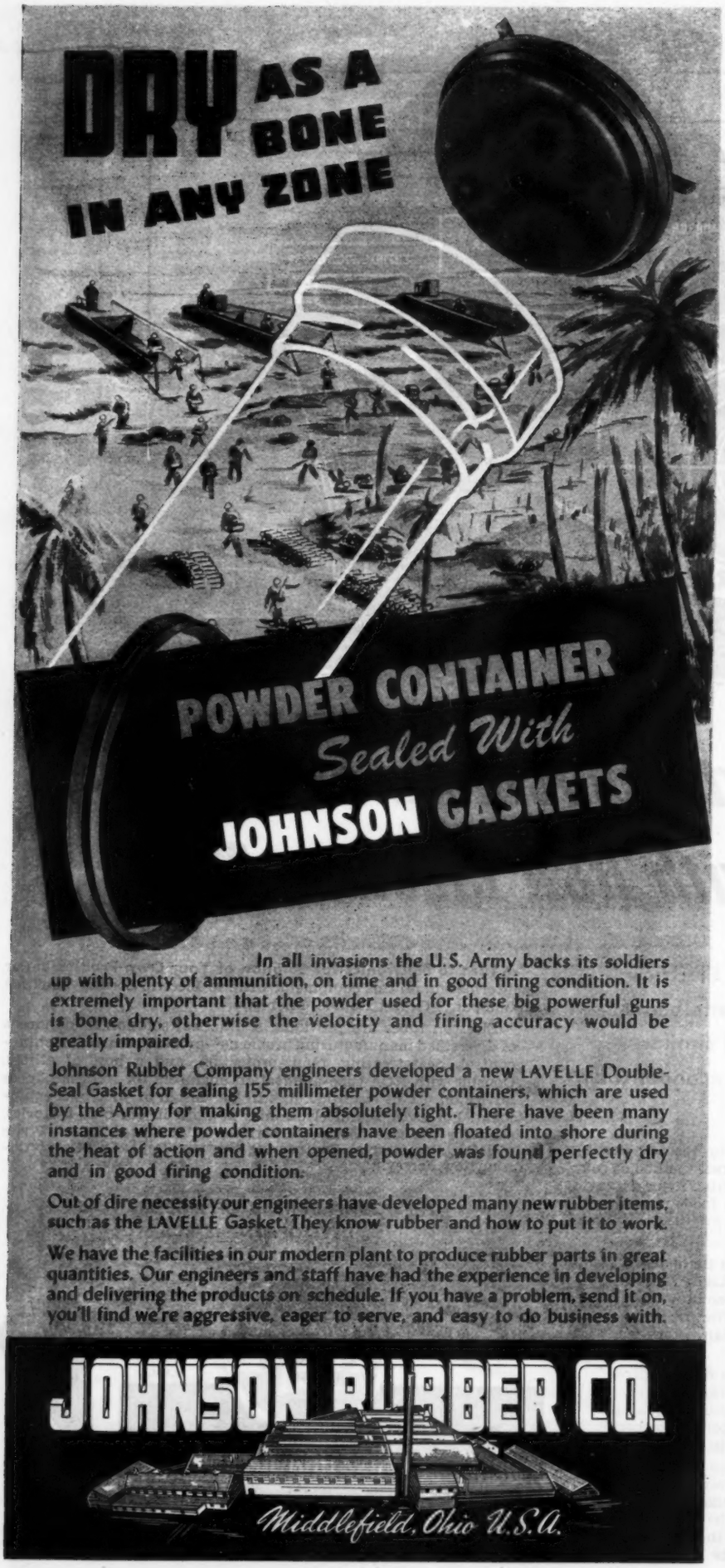
THE FOUNTAIN-HEAD OF MODERN TUBE DEVELOPMENT IS RCA

BUY BONDS BUY BONDS BUY BONDS BUY BONDS

RCA

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION, CAMDEN, N. J.



In all invasions the U.S. Army backs its soldiers up with plenty of ammunition, on time and in good firing condition. It is extremely important that the powder used for these big powerful guns is bone dry, otherwise the velocity and firing accuracy would be greatly impaired.

Johnson Rubber Company engineers developed a new LAVELLE Double-Seal Gasket for sealing 155 millimeter powder containers, which are used by the Army for making them absolutely tight. There have been many instances where powder containers have been floated into shore during the heat of action and when opened, powder was found perfectly dry and in good firing condition.

Out of dire necessity our engineers have developed many new rubber items, such as the LAVELLE Gasket. They know rubber and how to put it to work.

We have the facilities in our modern plant to produce rubber parts in great quantities. Our engineers and staff have had the experience in developing and delivering the products on schedule. If you have a problem, send it on, you'll find we're aggressive, eager to serve, and easy to do business with.

JOHNSON RUBBER CO.

Middlefield, Ohio U.S.A.

Motion and Time Study, Wage Incentives, and related subjects. University of Iowa. Ralph M. Barnes, Director, College of Engineering, University of Iowa, Iowa City.

Meetings Canceled

APRIL

Industrial Recreation Association, Annual Conference, scheduled for April 3-5, Detroit. Series of one-day conferences in key cities to be substituted. John W. Fulton, Executive Secretary, 1 North La Salle St., Chicago 2.

Midwest Power Conference, Annual Meeting, scheduled for April 9-10, Chicago. Stanton E. Winston, Conference Director, Illinois Institute of Technology, 3300 Federal St., Chicago 16.

American Society of Mechanical Engineers, Spring Meeting, scheduled for April 16-18, Boston. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.

American Management Association, Packaging Conference, scheduled for April 17-20, New York. Henry J. Howlett, Secretary, 330 West 42nd St., New York.

International Lighting Exposition, scheduled for April 19-23, Chicago. R. W. Straud, Publicity Chairman, 222 North Bank, Chicago.

American Foundrymen's Association, Foundry Congress, 49th Annual Meeting, scheduled for April 30-May 4, Detroit. R. G. McElwee, Chairman of Detroit Chapter, 222 West Adams St., Chicago 6.

MAY

National Association of Suggestion Systems, Spring Conference, scheduled for May 9-10, Detroit. H. F. Foley, Executive Secretary, 122 South Michigan Ave., Chicago.

American Management Association, Production Conference, scheduled for May 15-16, Cleveland. James O. Rice, Manager, 330 West 42nd St., New York.

American Leather Belting Association, National Meeting, New York. E. R. Rath, Executive Vice-President, 53 Park Row, New York.

Chamber of Commerce of the United States, Annual Meeting, New York. Ralph Bradford, General Manager, 1615 H St., N. W., Washington, D. C.

National Fire Protection Association, Annual Convention, Philadelphia. George W. Elliott, Secretary, 1129 Walnut St., Philadelphia.

JUNE

American Society of Refrigerating Engineers, Spring Meeting, scheduled for June 11-13, Milwaukee. A. B. Stickney, President, 50 West 40th St., New York.

American Institute of Electrical Engineers, National Technical Meeting, scheduled for June 25-29, Detroit. G. S. Rich, Technical Progress Committee, 33 West 39th St., New York.

American Society of Heating and Ventilating Engineers, Semi-Annual Meeting. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

American Society of Mechanical Engineers, Semi-Annual Meeting. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.